PROGRAM MANAGER FOR ROCKY MOUNTAIN ARSENAL

U.S. ARMY
MATERIEL COMMAND

— COMMITTED TO PROTECTION OF THE ENVIRONMENT —

DRAFT FINAL
DETAILED ANALYSIS
OF ALTERNATIVES REPORT
VERSION 2.0
STRUCTURES DAA
VOLUME VI of VII

JULY 1993
CONTRACT NO. DAAA 05-92-D-0002

EBASCO SERVICES INCORPORATED
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THE CONDUCT OF THE FEASIBILITY STUDY (FS) UNDER CERCLA IS ACCOMPLISHED IN TWO STEPS. THE FIRST STEP, THE DEVELOPMENT AND SCREENING OF ALTERNATIVES (DSA), INVOLVES IDENTIFYING AND SCREENING A BROAD SELECTION OF ALTERNATIVES THAT ACHIEVE THE REMEDIAL ACTION OBJECTIVES (ROAS). THE SECOND STEP IS THE DAA. THE OBJECTIVES OF THE DAA INCLUDE THE FOLLOWING: (1) PROVIDE A MORE DETAILED DEFINITION OF EACH ALTERNATIVE RETAINED IN THE DSA, AS NECESSARY, WITH RESPECT TO THE VOLUMES OR AREAS OF CONTAMINATED MEDIA TO BE ADDRESSED, THE TECHNOLOGIES TO BE USED, AND ANY PERFORMANCE REQUIREMENTS ASSOCIATED WITH THOSE TECHNOLOGIES. (2) ASSESS EACH ALTERNATIVE AGAINST THE DAA EVALUATION CRITERIA IDENTIFIED IN THE NATIONAL CONTINGENCY PLAN AND DEFINED IN U.S. EPA GUIDANCE (EPA 1988). (3) PERFORM A COMPARATIVE ANALYSIS AMONG THE ALTERNATIVES TO EVALUATE THE RELATIVE PERFORMANCE OF EACH ALTERNATIVE WITH RESPESCT TO EACH EVALUATION CRITERION. (4) SELECT A PREFERRED ALTERNATIVE FOR EACH MEDIUM GROUP BASED ON THE COMPARATIVE ANALYSIS. THE DAA REPORT CONSISTS OF SEVEN VOLUMES. VOLUME I - EXECUTIVE

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/l	micrograms per liter
3-D	three-dimensional
ACGIH	American Conference of Governmental Industrial Hygienists
ACM	asbestos–containing material
AMC	Army Materiel Command
AOC	Area of Contamination
AOPs	advanced oxidation processes
AR	Army Regulations
ARARs	applicable or relevant and appropriate requirements
Army	U.S. Army
atm-m^3/mol	atmospheres per cubic meters per mole
ATP	Anaerobic Thermal Processor
ATSDR	Agency for Toxic Substances and Disease Registry
BCY	bank cubic yard
BDAT	best demonstrated available technology
BEST	Basic Extraction Sludge Treatment
BFI	Browning Ferris Industries
BOD	Biological Oxygen Demand
BTEX	benzene, toluene, ethylbenzene, and xylenes
BTU	British thermal unit
CAMU	Corrective Action Management Unit
CAR	Contamination Assessment Report
CCA	chromated-copper-arsenate
CCR	Code of Colorado Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CLC2A	Chloroacetic Acid
cm/sec	centimeters per second
cm^2	centimeters squared
COC	contaminant of concern
CPE	chlorinated polyethylene
CPRP	Chemical Personnel Reliability Program
CRL	certified reporting limit
CSI	Conservation Services, Inc.
CSPE	chlorosulfonated polyethylene
CWA	Clean Water Act
CY	cubic yards
DA	Department of the Army
DAA	Detailed Analysis of Alternatives
DADS	Denver Arapahoe Disposal Service, Inc.
db(A)	decibels
DBCP	dibromochloropropane
DCPD	dicyclopentadiene
DDE	dichlorodiphenylethane
DDT	dichlorodiphenyltrichloroethane
DHHS	Department of Health and Human Services
DIMP	diisopropylmethyl phosphorate
DNAPL	dense nonaqueous phase liquid
DOD	Department of Defense

DOT	Department of Transportation
DRE	destruction removal efficiency
DRMO	Defense Reutilization and Marketing Office
DSA	Development and Screening of Alternatives
EA	Endangerment Assessment
Ecology	U.S. Ecology, Inc.
EDSVEP	Enhanced Deep Soil Vapor Extraction Process
ENSCO	Environmental Systems Company
Envirosafe	Envirosafe Services of Idaho, Inc.
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
ERC	Ecological Risk Characterization
ESSVEP	Enhanced Surface Soil Vapor Extraction Process
ETTS	Ecotechniek Thermal Treatment System
FC2A	fluoroacetic acid
FFA	Federal Facility Agreement
FML	flexible membrane liner
fpm	feet per minute
FRP	fiber - reinforced plastic
FS	feasibility study
ft/day	feet per day
ft	feet or foot
ft^3	cubic feet
GAA	granulated activated alumina
GAC	granular activated carbon
GB	isopropylmethylphosphonosfluoridate (nerve agent-sarin)
gpm	gallons per minute
H:V	horizontal to vertical
H_2O_2	hydrogen peroxide
HBr	hydrogen bromide
HCCPD	hexachlorocyclopentadiene
HCL	hydrochloric acid
HCPD	Hexachloro pentadiene
HDPE	high-density polyethylene
HE	high explosive
HEP	habitat evaluation protocol
HEPA	high efficiency particulate
HF	hydrofluoric acid
Hg	mercury
HHEA	Human Health Exposure Assessment
HHRC	Human Health Risk Characterization
HI	hazard index
ICP	inductively coupled plasma
ICS	Irondale Containment System
IDLH	Immediately Dangerous to Life and Health
IEA	Integrated Endangerment Assessment
IITRI	IIT Research Institute
IRA	interim response action
IT	International Technology
IWT	International Waste Technologies
K_{oc}	partition coefficient
kw	Kilowatt
kWh	Kilowatt hour

L	Lewisite
lbs	pounds
lbs/acre	pounds per acre
LCY	loose cubic yards
LCY/hr	loose cubic yards per hour
LDR	land disposal restriction
LF	Linear Foot
LNAPL	light nonaqueous phase liquid
LT^3	Low-Temperature Thermal Treatment
LTTA	Low-Temperature Thermal Aeration
mg/l	micrograms per liter
mg/cm^3	milligrams per cubic centimeter
mg/m^3	milligram per cubic meter
mg/kg	milligrams per kilogram
mg/l	microgram per liter
MKE	Morrison–Knudsen Engineering
ml/g	milliliters per gram
mm	millimeters
MMBTU	million British thermal units
mph	miles per hour
MTR	minimum technology requirement
NaOH	sodium hydroxide
NBCS	North Boundary Containment System
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NWBCS	Northwest Boundary Containment System
O&M	operations and maintenance
OAS	Organizations and State
°C	degrees Centigrade
OCP	organochlorine pesticides
OCPD	dicyclopentadiene
°F	degrees Fahrenheit
OPHGB	organophosphorus compounds, GB-agent related
OPHP	organophosphorus Compounds; pesticide related
OSCH	organosulfur compounds; herbicide related
OSCM	organosulfur Compounds; mustard agent related
OSHA	Occupational Health and Safety Administration
PAHs	polynuclear aromatic hydrocarbons
PBC	probabalistic biota criteria
PCB	polychlorinated biphenyls
pcf	pounds per cubic foot
PCP	pentachlorophenol
PEC	plume evaluation criteria
PKPP	potassium pyrophosphate
ppb	parts per billion
PPE	personal protective equipment
PPLV	preliminary pollutant limit value
ppm	parts per million
PRG	preliminary remediation goal
psi	pounds per square inch
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RAO	remedial action objectives

RCRA	Resource Conservation and Recovery Act
RF	radio frequency
RI	Remedial Investigation
RISR	Remedial Investigation Summary Report
RMA	Rocky Mountain Arsenal
ROD	Record of Decision
RPO	representative process option
SACWSA	South Adams County Water and Sanitation District
SAR	Study Area Report
SARA	Superfund Amendments and Reauthorization Act
SCC	Secondary Combustion Chamber
SEC	Site evaluation criteria
SF	square feet
Shell	Shell Oil Company
SHO	Semivolatile halogenated organics
SITE	Superfund Innovative Technology Evaluation
STC	Silicate Technology Corporation
SVE	soil vapor extraction
SVOCs	semivolatile organic compounds
SY	square yards
T.DI.	Services HT-5
TBC	to be considered
TCE	trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TEA	triethylamine
TEC	Target Effluent Concentrations
TIS	transportable incineration system
TMV	toxicity, mobility, and volume
TOC	total organic carbon
tpd	tons per day
TSCA	Toxic Substances Control Act
TSD	Treatment Storage and Disposal
TSMG	two-step geometric mean
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USPCI	U.S. Pollution Control, Inc.
UV	ultraviolet
UXO	unexploded ordnance
VAO	volatile aromatic organic compounds
VHC	volatile hydrocarbon compounds
VHO	volatile halogenated organics
VOC	volatile organic compound
VX	ethyl s-dimethyl aminoethyl methyl phosphonothiolate (nerve agent)
WES	Waterways Experimental Station

1.0 INTRODUCTION

The objective of the Detailed Analysis of Alternatives (DAA) for structures is to analyze the remedial alternatives retained from the Development and Screening of Alternatives (DSA) and select a preferred alternative for each of the structures medium groups. The objectives of the DAA include the following:

- Outline any modifications made to the structures medium groups and remedial alternatives since the DSA was completed (Sections 1.1 and 1.2).
- Describe the methodology for detailed analysis and selection of preferred alternatives for each medium group (Section 2).
- Describe the interactions of the structures medium with the other media at Rocky Mountain Arsenal (RMA) (Section 2).
- Develop volume estimates for the structures medium groups (Section 3).
- Describe and analyze the retained alternatives for each of the structures medium groups (Sections 4 through 8).
- Perform a comparative analysis of the retained remedial alternatives including selecting a preferred remedial alternative for each of the structures medium groups, discussing risk management issues for each medium group, and summarizing the remediation scenario for the structures medium (Section 9).

1.1 STRUCTURES MEDIUM GROUPS

As described in the DSA, the structures medium is heterogeneous due to the wide variety of structural types and materials it encompasses, i.e., all aboveground structures, buildings, foundations and basements, tanks (including underground storage tanks), tank farms, process and non-process equipment (including "bone yards"), aboveground chemical pipelines, asbestos-containing material (ACM), and other miscellaneous man-made objects placed at RMA since it was acquired by the U.S. Army (Army) in May 1942. The structures medium also includes artifacts, e.g. houses, barns, from earlier eras.

To facilitate the development and analysis of alternatives, four structures medium groups were developed during the DSA: Future Use, No Potential Exposure; No Future Use,

Nonmanufacturing History; No Future Use, Manufacturing History; and No Future Use, Agent History. As is evident from these names, structures with similar use histories were grouped together so that similar remedial options could be more efficiently applied and evaluated for each of the 983 structures at RMA. The No Future Use, Manufacturing History Medium Group was further defined during the DAA to include two subgroups, Process History and Non-Process History, which more accurately reflects their chemical use history. Section 3 defines and details the characteristics of all of the medium groups. Plate 1.1-1 shows the locations of the structures medium groups.

1.2 REMEDIAL ALTERNATIVES

During the DSA, remedial alternatives were developed and screened for each of the four structures medium groups. As part of the DAA process, the alternatives retained during the DSA for each medium group (Figures 1.2-1 through 1.2-4) were examined to determine whether any of the rejected alternatives should be re-evaluated or whether any of the retained alternatives should be modified. The rationale for changing the list of retained alternatives is based on several factors including changes in site conditions, changes in information regarding the structures, changes in information concerning technologies contained in the retained alternatives, changes in regulations, and changes in interactions with the other media of concern (i.e., soils and water). Changes were made to the retained alternatives list for the No Future Use, Manufacturing History and No Future Use, Agent History Medium Groups as described below.

Alphanumeric identifiers were used during the DSA to name the developed alternatives. The alphabetic codes were defined as follows:

- FN—Future Use, No Potential Exposure Problems
- NB—No Future Use, Nonmanufacturing History
- NA—No Future Use, Manufacturing History
- NH—No Future Use, Agent History

During the DAA, these alphabetic codes were dropped from use and the alternatives identified only by the number. In some cases, alternatives were added during the DAA. When this occurred, an "a" was attached to the number. For example, Alternative 9, which was developed for the No Future Use, Manufacturing History Medium Group originally included vacuum dusting or steam cleaning followed by salvage, dismantling, and landfilling. This alternative could not be effectively analyzed in detail because it contains two different in situ treatment technologies, vacuum dusting and steam cleaning. To simplify the detailed analysis, Alternative 9a was added and Alternative 9 modified such that Alternative 9 involves vacuum dusting, and Alternative 9a involves steam cleaning.

To analyze and select the most effective remedial alternatives for all of the media at RMA, the interactions between media were examined (Section 2.3). As a result, Alternative 21a was added to the list of retained alternatives and Alternative 21 modified. Alternative 21a includes salvaging, dismantling, and consolidating the resulting structural debris, creating an alternative that combines the consolidation of both soils and structural debris. The overall containment alternative for the soils South Plants Medium Group includes the capping of soils in the central processing area, so Alternative 21 was modified to place all of the structural debris from South Plants and outlying structures with soils in the cap to be located in the central processing area. In addition, to further minimize the amount of capped area, all the structural debris from North Plants and outlying structures is to be placed together in a single cap in North Plants and all structural debris from the Railyard and outlying structures is to be placed together in a single cap in the Railyard. In addition, since the structural debris is to be capped in centralized areas, the debris can be sized and compacted more efficiently, excluding the need for the geotextile base. Accordingly, the use of a geotextile base was removed from Alternative 21.

Alternatives 2a, 19a, and 20a were added for the Non-Process History Subgroup. Alternative 2 is a containment alternative that involves pipe plugging and access restrictions involving locks, boards, fences, and signs. The alternative is designed to immobilize residual contamination associated with process-related piping. Since structures in the Non-Process History Subgroup

contain no process piping, Alternative 2a was created. Alternative 2a involves containment (i.e., locks, boards, fences, and signs), but removes pipe plugging, which is not applicable to the Non-Process History Subgroup.

Alternatives 19 and 20 include disposing the structural debris in a hazardous waste landfill. These alternatives were designed to properly contain potentially hazardous debris. Since the structures in the Non-Process History Subgroup are not expected to be contaminated, disposal in a hazardous waste landfill is unnecessary. Alternatives 19a and 20a were therefore added to replace hazardous waste disposal with nonhazardous waste disposal for the structural debris.

As described earlier, the No Future Use, Manufacturing History Medium Group was divided into the Process History and the Non-Process History Subgroups during the DAA. The alternatives retained for this medium group were evaluated to determine the applicability of each alternative to the subgroups. Table 1.2-1 summarizes the range of alternatives that were analyzed during the DAA for subgroups in the No Future Use, Manufacturing History Medium Group.

For the No Future Use, Agent History Medium Group, one alternative that was rejected during the DSA was reconsidered in the DAA. Alternative 18 was rejected in the DSA due to implementation concerns associated with the peroxide/hypochlorite treatment of structural debris containing Army chemical agent. Further analysis of this treatment technology conducted for the soils medium indicated that many of the implementation concerns outlined in the DSA had been overcome in applications for soils and the demilitarization of agent-contaminated warheads. This prompted the re-evaluation of Alternative 18 in the DAA for the structures medium. Moreover, Alternative 18a, which adds in situ sand blasting to Alternative 18, was developed so that a treatment technology applicable to contaminants other than Army chemical agent could be evaluated. Table 1.2-2 lists the range of alternatives applicable to the No Future Use, Agent History Medium Group.

Table 1.2-1 No-Future Use, Manufacturing History Medium Group Alternatives

Subgroup	Alternatives for Detailed Analysis
Process History	1: No Action (NA1)
	2: Pipe Plugs, Locks/ Boards/Fences/Signs (NA2)
	8: Hot Gas, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill (NA8)
	9: Vacuum Dusting, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill (NA9)
	9a: Steam Cleaning, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill (NA9a)
	10: Sand Blasting, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill (NA10)
	12: Dismantling, Salvage, Off-Post Rotary Kiln Incineration, Off-Post Hazardous Waste Landfill (NA12)
	13: Dismantling, Salvage, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill (NA13)
	19: Dismantling, Salvage, On-Post Hazardous Waste Landfill (NA19)
	20: Dismantling, Salvage, Off-Post Hazardous Waste Landfill (NA20)
	21: Dismantling, Salvage, Clay Cap (NA21)
	21a: Dismantling, Salvage, Consolidation (NA21a)
Non-Process History	1: No Action (NA1)
	2a: Locks/Boards/Fences/Signs (NA2a)
	19a: Dismantling, Salvage, On-Post Nonhazardous Waste Landfill (NA19a)
	20a: Dismantling, Salvage, Off-Post Nonhazardous Waste Landfill (NA20a)
	21: Dismantling, Salvage, Clay Cap (NA21)
	21a: Dismantling, Salvage, Consolidation (NA21a)

Table 1.2-2 No Future Use, Agent History Medium Group Alternatives

Medium Group	Alternatives for Detailed Analysis
No Future Use, Agent History	1: No Action (NH1) 4: Hot Gas, Dismantling, On-Post Hazardous Waste Landfill (NH4) 6: Hot Gas, Dismantling, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill (NH6) 14: Dismantling, On-Post Hazardous Waste Landfill (NH14) 15: Dismantling, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill (NH15) 17: Dismantling, Hot Gas, On-Post Hazardous Waste Landfill (NH17) 18: Dismantling, Peroxide/Hypochlorite, On-Post Hazardous Waste Landfill (NH18) 18a: Sand Blasting, Dismantling, Peroxide/Hypochlorite, On-Post Hazardous Waste Landfill (NH18a)

DEVELOPED ALTERNATIVE	RETAINED ALTERNATIVE
No Action Alternative	
FN1. No Action	FN1. No Action

Figure 1.2-1 Summary of Alternative Screening
Future Use, No Potential Exposure Problems

REJECTED
RETAINED

DEVELOPED ALTERNATIVE	RETAINED ALTERNATIVE

No Action Alternative

NB1. No Action	NB1. No Action

Figure 1.2-2 Summary of Alternative Screening
No Future Use, Nonmanufacturing History

REJECTED
RETAINED

DEVELOPED ALTERNATIVE	RETAINED ALTERNATIVE
No Action Alternative	
NA1. No Action	NA1. No Action
Reclamation, Containment, Institutional Controls	
NA2. Salvage, Building/Pipe Plugs, Locks/Boards/Fences/Signs	NA2. Salvage, Building/Pipe Plugs, Locks/Boards/Fences/Signs
NA3. Salvage, Room Closure, Locks/Boards/Fences/Signs	
In Situ Treatment, Reclamation, Institutional Controls	
NA4. Hot Gas, Salvage, Locks/Boards/Fences/Signs	
NA5. Sand Blasting, Salvage, Locks/Boards/Fences/Signs	
NA6. Vacuum Dusting or Steam Cleaning, Salvage, Locks/Boards/Fences/Signs	
NA7. Acid Etching/Neutralization, Salvage Locks/Boards/Fences/Signs	
In Situ Treatment, Reclamation, Demolition, Landfill	
NA8. Hot Gas, Salvage, Dismantling or Detonation, On-Post Nonhazardous Waste Landfill	NA8. Hot Gas, Salvage, Dismantling or Detonation, On-Post Nonhazardous Waste Landfill
NA9. Vacuum Dusting or Steam Cleaning, Salvage, Dismantling or Detonation, On-Post Nonhazardous Waste Landfill	NA9. Vacuum Dusting or Steam Cleaning, Salvage, Dismantling or Detonation, On-Post Nonhazardous Waste Landfill
NA10. Sand Blasting, Salvage, Dismantling or Detonation, On-Post Nonhazardous Waste Landfill	NA10. Sand Blasting, Salvage, Dismantling or Detonation, On-Post Nonhazardous Waste Landfill
NA11. Acid Etching/Neutralization, Salvage, Dismantling or Detonation, On-Post Nonhazardous Waste Landfill	

Figure 1.2-3 Summary of Alternative Screening No Future Use, Manufacturing History

REJECTED
RETAINED

Reclamation, Demolition, Treatment of Debris and Waste, Landfill

DEVELOPED ALTERNATIVE	RETAINED ALTERNATIVE
NA12. Salvage, Dismantling or Detonation, Off-Post Rotary Kiln Incineration, Off-Post Hazardous Waste Landfill	NA12. Salvage, Dismantling or Detonation, Off-Post Rotary Kiln Incineration, Off-Post Hazardous Waste Landfill
NA13. Salvage, Dismantling or Detonation, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill	NA13. Salvage, Dismantling or Detonation, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill
NA14. Salvage, Dismantling or Detonation, Glassification, On-Post Nonhazardous Waste Landfill	
NA15. Salvage, Dismantling or Detonation, Hot Gas, On-Post Nonhazardous Waste Landfill	
NA16. Salvage, Dismantling or Detonation, Vacuum Dusting or Steam Cleaning, On-Post Nonhazardous Waste Landfill	
NA17. Salvage, Dismantling or Detonation, Acid Etching/Neutralization, On-Post Nonhazardous Waste Landfill	
NA18. Salvage, Dismantling or Detonation, Thermoplastic Microencapsulation, On-Post Nonhazardous Waste Landfill	

Reclamation, Demolition, Landfill

DEVELOPED ALTERNATIVE	RETAINED ALTERNATIVE
NA19. Salvage, Dismantling or Detonation, On-Post Hazardous Waste Landfill	NA19. Salvage, Dismantling or Detonation, On-Post Hazardous Waste Landfill
NA20. Salvage, Dismantling or Detonation, Off-Post Hazardous Waste Landfill	NA20. Salvage, Dismantling or Detonation, Off-Post Hazardous Waste Landfill

Reclamation, Demolition, Containment

DEVELOPED ALTERNATIVE	RETAINED ALTERNATIVE
NA21. Salvage, Dismantling or Detonation, Clay Cap with Geotextile Base	NA21. Salvage, Dismantling or Detonation, Clay Cap with Geotextile Base

Structures DAA

Figure 1.2-3 Summary of Alternative Screening
No Future Use, Manufacturing History

REJECTED (shaded)	RETAINED

DEVELOPED ALTERNATIVE	RETAINED ALTERNATIVE
No Action Alternative	
NH1. No Action	NH1. No Action
In Situ Treatment, Institutional Controls	
NH2. Hot Gas, Locks/Boards/Fences/Signs	
NH3. Peroxide/Hypochlorite, Locks/Boards/Fences/Signs	
In Situ Treatment, Demolition, Landfill	
NH4. Hot Gas, Dismantling or Detonation, On-Post Hazardous Waste Landfill	
NH5. Peroxide/Hypochlorite, Dismantling or Detonation, On-Post Hazardous Waste Landfill	
In Situ Treatment, Demolition, Treatment of Debris and Waste, Landfill	
NH6. Hot Gas, Dismantling or Detonation, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill	NH6. Hot Gas, Dismantling or Detonation, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill
NH7. Hot Gas, Dismantling or Detonation, Glassification, On-Post Hazardous Waste Landfill	
NH8. Hot Gas, Dismantling or Detonation, Hot Gas, On-Post Hazardous Waste Landfill	
NH9. Hot Gas, Dismantling or Detonation, Peroxide/Hypochlorite, On-Post Hazardous Waste Landfill	
NH10. Peroxide/Hypochlorite, Dismantling or Detonation, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill	
NH11. Peroxide/Hypochlorite, Dismantling or Detonation, Glassification, On-Post Nonhazardous Waste Landfill	
NA12. Peroxide/Hypochlorite, Dismantling or Detonation, Hot Gas, On-Post Hazardous Waste Landfill	
NA13. Peroxide/Hypochlorite, Dismantling or Detonation, Peroxide/Hypochlorite, On-Post Hazardous Waste Landfill	

Structures DAA

Figure 1.2-4 Summary of Alternative Screening No Future Use, Agent History

REJECTED
RETAINED

DEVELOPED ALTERNATIVE	RETAINED ALTERNATIVE
Demolition, Landfill	
NH14. Dismantling or Detonation, On-Post Hazardous Waste Landfill	NH14. Dismantling or Detonation, On-Post Hazardous Waste Landfill
Reclamation, Treatment of Debris and Waste, Landfill	
NH15. Dismantling or Detonation, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill	
NH16. Dismantling or Detonation, Glassification, On-Post Nonhazardous Waste Landfill	
NH17. Dismantling or Detonation, Hot Gas, On-Post Hazardous Waste Landfill	NH17. Dismantling or Detonation, Hot Gas, On-Post Hazardous Waste Landfill
NH18. Dismantling or Detonation, Peroxide/Hypochlorite, On-Post Hazardous Waste Landfill	

Structures DAA

Figure 1.2-4 Summary of Alternative Screening No Future Use, Agent History

REJECTED
RETAINED

2.0 DAA METHODOLOGY FOR THE STRUCTURES MEDIUM

The DAA procedure for the structures medium is consistent with the U.S. Environmental Protection Agency (EPA) Guidance for Conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (EPA-OERR 1988b). The Executive Summary describes the overall DAA procedure. The structures medium is complex, however, and contains unique concerns that must be addressed during the DAA. The following sections describe the DAA process as applied to the structures medium:

- Section 2.1 – Volume and Area Estimates
- Section 2.2 – Description and Analysis of Remedial Alternatives
- Section 2.3 – Media Interactions
- Section 2.4 – Structures Sampling

2.1 VOLUME AND AREA ESTIMATES

As a basis for estimating and comparing alternative costs in the DSA, a single RMA structure was identified to represent each medium group. The cost of each alternative was estimated for that structure and that cost was then used to represent costs for the entire medium group. Although this was an effective approach during the screening process, it did not provide an estimate of the total cost of implementing an alternative for all of the structures contained within a medium group.

To estimate remedial alternative costs in the DAA, total volume and area estimates for all of the structures in each medium group were calculated. To provide the information necessary to estimate costs, the following volumes and areas were estimated for each medium group:

- Collapsed standing volume of buildings
- Interior and exterior surface areas
- Volumes of construction material (e.g., brick, wood, metal)
- Volume of treatable surfaces

These estimates were calculated using the information provided in the Task 24 Final Structures Survey report (EBASCO 1988/RIC 88306R02), which was produced as part of the 1987 remedial investigation (RI) at RMA. Section 3 details the volume and area estimates for each of the structures medium groups and Appendix B contains the formulas used to estimate these quantities.

2.2 DESCRIPTION AND ANALYSIS OF REMEDIAL ALTERNATIVES

Sections 4 through 8 describe and analyze only those alternatives retained for the structures medium, while the Technology Description Volume details the mechanics of all of the individual process options. This reporting format allows the descriptions and analyses presented in Sections 4 through 8 to focus on the treatment train for an entire alternative.

The following sections explain the approach used to describe and analyze alternatives for the structures medium. In contrast to the soils and water media, most of the alternatives retained for the structures medium are very similar: in many cases there is only one process option that differentiates one alternative from another. Accordingly, the descriptions and analyses for most of the alternatives focus only on these differences.

2.2.1 <u>Alternative Descriptions</u>

Most of the alternatives developed for the structures medium are very similar. For example, for the No Future Use, Manufacturing History Medium Group, Alternatives 8, 9, 9a, 10, 12, 13, 19, 19a, 20, and 20a involve demolishing the structure and placing the debris in a landfill. Likewise for the No Future Use, Agent History Medium Group, Alternatives 4, 6, 14, 15, 17, and 18 involve these common elements: demolishing the structure and placing the debris in an on-post landfill. To avoid redundancy in describing the alternatives, Section 6 provides a description of the general alternative that includes demolition and landfilling. The subsequent descriptions of the individual alternatives focus on the differences of each specific alternative from the general alternative. Therefore, the description of Alternative 9—vacuum dusting followed by demolition

and landfilling—focuses on how vacuum dusting and the type of landfilling differentiate the alternative from the general description.

2.2.2 Detailed Analysis of Alternatives

As is the case with the descriptions of the alternatives, most of the analyses of the alternatives are very similar. Therefore, in addition to the description of the general alternatives (Section 2.2.1), a "general analysis" of the seven evaluation criteria is also provided. (For a discussion of the seven criteria—overall protection of human health and the environment; compliance with applicable, relevant, or appropriate requirements or (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility, or volume or (TMV); short-term effectiveness; implementability; and cost—see the Executive Summary.) For example, for the No Future Use, Manufacturing History Medium Group, Non-Process History Subgroup, an analysis of salvage, demolition, and landfilling is provided (Section 7) for all of the criteria except cost, which is unique for each alternative, and for the No Future Use, Agent History Medium Group, an analysis of demolition and landfilling is provided (Section 8) for all of the criteria except cost, which is unique for each alternative. The individual analysis of each alternative focuses on the differences from the general analysis. For example, the analysis of Alternative 9 focuses on how vacuum dusting and the specific type of landfilling affects the applicability and performance of the alternative.

2.2.3 Ongoing Actions Affecting Structures Remedial Alternatives

There are several ongoing activities that affect the structures remedial alternatives, the most significant of which are the following:

- Asbestos Interim Remedial Action (IRA)
- Polychlorinated Biphenyl (PCB) removal
- Chemical-process-related activities
- Underground storage tank removal
- Aboveground storage tank removal

The scope of the Asbestos IRA is to remove and dispose all ACM from RMA structures, piping and tanks. For the DAA, it was assumed that all costs associated with removing and disposing ACM are included as part of the Asbestos IRA. The Asbestos IRA may not be complete before the structures remediation begins, so any asbestos remaining in the structures will be removed as an integral part of the remediation process. In addition, since the scope of the PCB removal activity includes removal and disposal of all PCB-containing materials that are regulated under the Toxic Substances Control Act (TSCA), those costs are included under that program.

The current scope of the chemical-process-related activities includes removing all Army chemical agent and nonagent process equipment and piping from structures at RMA and stockpiling them on post. For the DAA, it was assumed that all process equipment and pipes are removed and cleaned prior to structures remediation. Since the scope of the chemical-process-related activities does not include disposal, the applicable costs for salvaging, transporting, and disposing process equipment and pipes is included as part of structures remediation.

The scopes of both the aboveground and underground storage tank removal actions are to remove all petroleum and hazardous substance tanks at RMA. The underground storage tanks are to be disposed as scrap metal, but the aboveground storage tanks are to be stockpiled on post. Therefore, the costs for salvaging, transporting, and disposing aboveground tanks are included as part of structures remediation.

Appendix C, Table 9.4-4 lists the estimated costs for these activities. The total estimated cost for these actions is $130,000,000. These costs must be added to the costs developed during the DAA to obtain realistic remediation costs for the structures medium at RMA.

2.3 MEDIA INTERACTIONS

Remedial alternatives selected for each medium must be compatible so that they may be combined into a single remediation scenario that encompasses all of RMA. Accordingly, it is important to determine the interaction between the media and use this information both on a

medium-specific and RMA-wide basis. There are no alternatives developed for the water medium that directly impact the alternative selection for the structures medium, but there are several interactions between the structures and soil media that must be taken into consideration.

Several soils alternatives impact the structures alternative selection for both the No Future Use, Manufacturing History and No Future Use, Agent History Medium Groups. For example, the decision to cap sites within the Soils Agent Storage and South Plants Medium Groups and to excavate the Hex Pit disposal trench precludes the choice of no action or containment alternatives for structures in the No Future Use, Manufacturing History Medium Group: the structures must be removed to access underlying soils. Conversely, the decision to cap the two sites within the Soil Basin A Medium Group as well as areas in South Plants and North Plants allows the structures medium to evaluate consolidation of structural debris as a potential remedial alternative since the fill material necessary in these areas far exceeds the total volume of structural debris. In addition, the choice to cap sites contained within the Agent Storage and South Plants Soil Medium Groups removes the No Action alternative for structures in the No Future Use, Agent History Medium Group since the structures must be removed to access underlying soils. Plate 1.1-1 shows the interaction between the structures and soils media. When a structures alternative includes demolition, the foundations of the structure involved are to be removed if they interfere with soils alternatives. Foundations may not be removed if soils alternatives do not require it.

2.4 STRUCTURES SAMPLING

Sampling structures in an attempt to determine risk is inappropriate because there are no standard sampling procedures for standing structures and because there is a lack of standards or action levels for addressing structural contamination even when analytical results are available. The detection of an analyte in structural material does not necessarily imply that the analyte poses a risk to human health or the environment. The words "contaminant" and "contamination," when used with respect to structures, indicate only the presence or potential presence of analytes as detected in a specific sampling program; they do not necessarily imply any hazards to human

health or the environment. Structures sampling is to be performed only to support the structures remediation. The sampling techniques to be employed have not yet been determined, but may include guidance from the protocols derived from the expert panel on structure sampling. The type and extent of sampling that may be performed for the structures medium groups is as follows:

- Future Use, No Potential Exposure—Structures may be sampled as necessary in accordance with the Occupational Health and Safety Administration (OSHA).

- No Future Use, Manufacturing History—This medium group was divided into two subgroups, Process History and Non-Process History, as described in Section 1. It was assumed that 30 percent of the floor space of any structure in the Process History Subgroup was directly involved with a manufacturing process and therefore has the potential for contamination. The results of the pilot structures sampling program support the fact that only portions of those structures with a history of manufacturing activity have a potential for contamination. In addition, the demolition process, as described in this document, allows the segregation of potentially contaminated and potentially uncontaminated structural debris. Post-demolition sampling is to be applied to this subgroup as follows. For disposal in a nonhazardous waste landfill, a representative composite sample from all potentially nonhazardous waste is collected for every 100-cubic yard (CY) lot of debris. Any potentially hazardous waste is sampled in 20-CY lots (one truckload of debris) to determine whether the facility can accept the waste. For disposal in a hazardous waste landfill, all debris is sampled in 20-CY lots to characterize the waste stream for compliance with applicable landfill regulations.

  For the Non-Process History Subgroup, it was assumed that all debris is potentially nonhazardous, an assumption that is supported by the results of the pilot structures sampling program. Post-demolition sampling of this debris is collected from each 100-CY lot to confirm whether it should be disposed in a hazardous or nonhazardous waste landfill.

  The preferred alternative (Section 9.4) for both subgroups entails consolidating both soils and structural debris within the area of contamination (AOC). A debris sample will be taken every 1000 CY for confirmational analysis prior to consolidation. This sampling frequency is greater than that planned for soils, which samples every 2000 CY, but is justified because of the heterogenous nature of structure debris in comparison to soils. This same sampling rationale is also valid for capping the structural debris in place (Alternative 21).

  For costing purposes, the analysis includes characterization according to the Resource Conservation and Recovery Act (RCRA), including full Toxicity Characteristic Leaching Procedure (TCLP) analysis expanded to include all RMA target analytes. The exact

analyses, however, cannot be determined until a final list of ARARs has been approved. The appropriate analyses will be chosen to satisfy all applicable ARARs.

- No Future Use, Agent History—The preferred alterative (Section 9.4) entails placing debris in an on-post hazardous waste landfill. Post-demolition sampling of the structural debris is conducted to characterize the waste stream. Once the structural debris has met the requirements of Army Regulations (AR) 385-131, it is sampled in 20-CY lots to comply with all applicable landfill regulations.

The results of the pilot structures sampling program were released in March 1993. Based on this information, the Army's expert panel on structure sampling has provided input concerning modifications of the sampling protocol developed as a result of panel meetings. These modifications were incorporated into the sampling protocol. As stated above, however, no decision has been made on the use of these protocols at RMA.

Additional sampling associated with the Army's pilot demolition program is also to be conducted as a treatability study. As part of this effort, sampling will be performed based on historical data to determine specific contaminant concentrations to support the testing of treatment methods. The results of this effort are not expected to be available until early 1994, and therefore cannot be incorporated into this document.

Again, predemolition sampling of structures to determine risk is inappropriate. The extent of post-demolition sampling and the actual waste analyses that will be performed cannot be determined until the final list of ARARs is approved since all sampling and analysis must satisfy all ARARs.

3.0 STRUCTURES MEDIUM GROUPS

3.1 INTRODUCTION

This section summarizes the background information relevant to the structures medium at RMA, describes how and why the structures medium groups were developed, and provides the quantity estimates that were developed for costing. The primary background document providing information on structures at RMA is the Task 24 Final Structures Survey report (EBASCO 1988/RIC88306R02).

3.2 BACKGROUND INFORMATION

The Structures Survey, performed in 1986, identified 982 structures at RMA based on extensive field observations and take-offs from available drawings. The 982 structures encompassed roughly 2.6 million square feet, and the total volume of structural materials was approximately 250,000 bank cubic yards (BCY). Structural materials, as used in this report, refer to all materials associated with the structures, not just load-bearing materials.

Of the 982 structures, 725 were located in three clusters: 524 (53 percent) were in South Plants, Sections 1 and 2; 118 (12 percent) were located in North Plants, Section 25; and 83 (9 percent) were located in the Railyard, Sections 3 and 4. The remaining 257 structures (26 percent) were distributed individually or in small clusters throughout RMA. The distribution of material volumes among clusters of structures roughly corresponded to the percentages given above. The history and use of the structures are summarized in the Structures DSA report. Since the 1987 survey, 42 structures have been removed, 42 new structures have been added. In addition, one structure, the Toxic Storage Yard, contains only berms and is being handled as part of the soils medium, and the designation of one structure has been changed from a single number to three individual numbers. Appendix A, Tables A.1-1 through A.1-5 list each of the RMA structures, which currently total 983. Appendix A, Table A.1-6 lists the structures that were removed, and Appendix A, Table A.1-7 lists those structures that may be used during the remediation process. All of the new structures have already been added to the appropriate structures medium groups, as discussed in Section 3.3.

3.3 STRUCTURES DAA MEDIUM GROUPS

Due to the complexity of the structures medium, all RMA structures were divided into medium groups during the DSA to aid the development and initial screening of remedial alternatives. The structures at RMA were divided into four medium groups including Future Use, No Potential Exposure; No Future Use, Nonmanufacturing History; No Future Use, Manufacturing History; and No Future Use, Agent History. During the DAA, the No Future Use, Manufacturing History Medium was subdivided into Process History and Non-Process History Subgroups. Appendix A, Tables A.1-1 through A.1-5 list the structures in each of the medium groups.

3.3.1 Future Use, No Potential Exposure

The Future Use, No Potential Exposure Medium Group consists of structures that are currently in use and are anticipated to have a post-remediation use. "Future use" is defined as having a long-term use after the RMA remediation is complete. There is no historical evidence to indicate structures within this medium group are contaminated; therefore, the ultimate disposition of these structures is outside the CERCLA process. No Action was the only alternative retained for this medium group. There are 25 structures in this medium group.

3.3.2 No Future Use, Nonmanufacturing History

The No Future Use, Nonmanufacturing History Medium Group includes all structures that did not serve in a manufacturing capacity and are not collocated with manufacturing history structures. These structures generally served administrative, utility, or support functions. There is no historical evidence to indicate structures within this medium group are contaminated; therefore, the ultimate disposition of these structures is outside the CERCLA process. No Action was the only alternative retained for this medium group. There are 103 structures in this medium group.

3.3.3 No Future Use, Manufacturing History

The No Future Use, Manufacturing History Medium Group refers to all structures in which employees manufactured, stored, transferred, or shipped any chemical products or raw materials.

Structures collocated with manufacturing history structures were also placed in this medium group because of their proximity to areas where chemical products or raw materials were handled. This is the largest medium group, containing 788 structures.

Structures having no potential for future use and having a manufacturing history were categorized into two subgroups based on knowledge of the specific manufacturing process history and contaminant release history for each structure. The Process History Subgroup consists of structures that were directly involved in a manufacturing process or have documented occurrences of spills. Based on historical knowledge and the results of the pilot structures sampling program, it was assumed that 30 percent of the floor space of any structure in this subgroup is potentially contaminated. There are 365 structures in this subgroup. The Non-Process History Subgroup refers to structures that do not have a manufacturing use history or documented spills, but that are collocated with process history structures. These structures served support functions, consisting of buildings such as change houses, cafeterias, and administrative buildings. The potential for contamination in these structures is low, but contamination is possible based on their location. It was assumed that the debris from this subgroup is potentially noncontaminated. There are 423 structures in this subgroup.

3.3.4 No Future Use, Agent History

The No Future Use, Agent History Medium Group consists of 67 structures in which employees contained, handled, or processed the Army chemical agents mustard (H, HD, or HT), isopropylmethyl phosphonofluoridate (GB), ethyl s-dimethylaminoethyl methylphosphonothiolate (VX), or lewisite (L).

Many of the structures in this medium group come under the control of three current or pending international agreements on chemical weapons. The provisions of these agreements will affect the waste management and remediation practices for structure in this medium group as follows:

- In September 1989, a Memorandum of Understanding was signed by the United States and the Soviet Union, and later adopted by Russia as successor. The memorandum sets

up a mechanism to exchange data on chemical weapons production facilities and stockpiles, and also sets up on-site inspections to verify the data.

- In June 1990, a bilateral agreement on destruction and nonproduction of chemical weapons was signed by the United States and the Soviet Union and later adopted by Russia as successor. The goal of this agreement is the destruction of all but 5,000 tons of chemical agent for each country. It calls for on-site inspections of agent destruction areas and emptied storage areas and designates structures at RMA that are subject to the agreement (Plate 3.0-1), slating them for complete demolition. This agreement may be replaced with the multilateral chemical weapons convention, if agreement can be reached by both parties.

- The multilateral chemical weapons convention has the goal of complete destruction of chemical weapons and chemical weapons production facilities. This convention was signed by more than 120 countries in January 1993, and is scheduled to take effect on January 15, 1995. It applies to chemical weapons facilities designed, built, or used since January 1946. It allows on-site inspections and direct monitoring of destruction activities.

These agreements apply to designated agent-history structures, which are shown on Plate 3.0-1 and listed in Appendix A. The effect of the agreements is that international inspection teams have access to the structures and their records, and that the structures and their process equipment will be destroyed. Any remedial actions involving these structures must comply with the terms of the agreements including destruction of structures and equipment, cooperating with inspection teams, and preparing acceptable documentation.

As shown on Plate 3.0-1 the agreements also include support structures that are not part of the No Future Use, Agent History Medium Group since these structures were not directly related to Army chemical agent production. These structures will be handled as part of their respective medium groups, but additional disposal documentation will be necessary for these structures to

comply with the agreements. All structures governed by the treaties are denoted with a "T" in Appendix A.

Structures in the No Future Use, Agent History Medium Group may also contain other contamination that may be considered hazardous. The Army has determined that this group of structures must be handled in accordance with Army Material Command (AMC) AR 385-131, which governs the handling, decontamination, and disposal of agent-contaminated materials.

3.4 STRUCTURAL MATERIAL QUANTITY ESTIMATES

Quantity estimates for the structure medium were prepared in order to develop remedial alternative costs for the DAA. These data are based on field reconnaissance estimates and are considered sufficient for the purposes of this report. The 42 structures added since the Task 24 survey do not have survey data available, and are currently not included in the material quantity estimates. When this information becomes available, it may be incorporated into the cost estimates if it appears to have a significant cost impact. Of the 42 new structures, 17 are in the Process History Subgroup, 16 are in the Non-Process History Subgroup, and 9 are in the Future Use, No Potential Exposure Medium Group. Initial quantity estimates for additional process structures indicate that they represent less than 10 percent of the total volume and surface area of the group, and that they do not represent a significant increase in the current cost estimate.

The Task 24 survey collected a variety of information on each structure—including standing and collapsed volumes, material types, number of floors, etc.—that was used to create the Task 24 Database. For the purposes of the DAA, a number of assumptions and algorithms were applied to the database to estimate the quantities of materials for use in developing cost estimates for the various treatment alternatives. Appendix B details the process, and Tables 3.5-1 through 3.5-3 summarize the estimating results.

Some of the DAA quantity data were taken directly from the Task 24 Database, including the following:

- Standing volume of the structure
- Collapsed volume of the structure
- Square footage of the structure (structure footprint)
- Collapsed volume of the process equipment
- Collapsed volume of the piping

Costs for hot gas, steam cleaning, vacuum dusting, and sand blasting treatments and estimates of salvage quantities of individual material types (e.g., wood, metal, concrete) were calculated by applying algorithms to the Task 24 Database, which identified material types for walls, roofing, and foundations, and by applying the following assumptions. The roof material was assumed to be composed entirely of the reported type, as was the foundation material. The reported wall material was assumed to make up the remainder of the structure, including floors. The roof was assumed to be an 0.1 foot (ft) thick and to have an area that is the same as the building footprint. The volume of the roof material was subtracted from the total structure volume to determine the volume of the walls and interior materials. Foundation materials were reported separately. Structural material types were then added together and reported as total volumes for each type of material for each medium group.

The treatable surface areas for the treatment alternatives were calculated from these volume estimates based on the following assumptions. The in situ treatment of structures was assumed to be limited to the production areas. Based on an examination of structural blueprints of several production buildings, 30 percent of each process history structure's interior surface area and foundation was assumed to be directly involved in production, and that within that section of the building the treatment is applied to the floors and 5 ft up the walls. The treatable surface area for in situ sand blasting and vacuum dusting was assumed to include the production areas of buildings, and were assumed to be constructed of metal, concrete, tile, brick, or masonry. The treatable surface area for in situ steam cleaning was assumed to be similar to that for sand blasting and vacuum dusting; however, the wall types were limited to metal, concrete, tile, or masonry since steam cleaning is not applicable to surfaces that tend to absorb water. The

treatable surface area for in situ hot gas treatment was assumed to only be applicable to calculated only for nonflammable surfaces within production areas. The interior and exterior surface area for hot gas treatment of nonflammable debris was calculated assuming each story of a structure is 15 ft tall.

Quantities regarding the footprint area (the square footage of the structure) and the perimeter length areas were derived for the containment options. The footprint area was derived from the square footage of the structure, which was divided by the number of stories. The perimeter length was derived from the footprint area. The values of the factors depended on the size of the footprint area (Appendix B).

3.5 ESTIMATES OF SALVAGEABLE MATERIALS

The only potentially salvageable material from the structures medium is metal. The data used for structural material types were modified to determine quantities of salvageable materials. The volume of metal was calculated based on the following assumptions. Salvageable metals included sheet metal, structural steel, as well as cleaned equipment and piping. The current scope of the chemical-process-related activities includes decontaminating and stockpiling all non agent process equipment and piping. The total estimated volume of salvageable stockpiled material was decreased by 20 percent to account for wastage. No structural steel or sheet steel will be reclaimed from structures in the Process History Subgroup due to the cost of cleaning the material and the low salvage value. All metal will be salvaged from the Non-Process History Subgroup with the total estimated volume decreased by 50 percent to account for wastage. Salvage is not applicable for the Agent History Medium Group.

Table 3.5-1 Material Volumes for No Future Use, Manufacturing History Medium Group – Non-Process History Subgroup

Total Number of Structures	423
Total Standing Volume	210,108 cubic yards
Total Collapsed Volume	30,201 cubic yards
Total Collapsed Volume of Process Equipment	558 cubic yards
Total Collapsed Volume of Piping	326 cubic yards
Total Collapsed Volume of:	
Concrete	17,411 cubic yards
Wood	1,155 cubic yards
Tile	1,785 cubic yards
Brick	2,351 cubic yards
Masonry/Cinder Block	2,810 cubic yards
Corrugated Metal	2,864 cubic yards
Corrugated Asbestos	1,575 cubic yards
Asbestos Board	98 cubic yards
Fiberglass	0 cubic yards
Asphalt Shingle	262 cubic yards
Built-Up/Hot Tar	186 cubic yards
Sheet Metal	1 cubic yards
Wood and Asphalt	1 cubic yard
Scrap Metal Salvage Volume	2,517 cubic yards
Total Structure Footprint	407,730 square feet
Capping Area	77,827 square feet
Total Structure Perimeter with 10-foot Buffer	51,070 linear feet
Treatable Surface Area for Sand Blasting and Vacuum Dusting	206,730 square feet
Treatable Surface Area for Steam Cleaning	160,660 square feet
Interior Surface Area	1,081,315 square feet
Exterior and Interior Surface Area	1,651,979 square feet

Table 3.5-2 Material Volumes for No Future Use, Manufacturing History Medium Group – Process History Subgroup

Total Number of Structures	365
Total Standing Volume	631,646 cubic yards
Total Collapsed Volume	74,487 cubic yards
Total Collapsed Volume of Process Equipment	3,907 cubic yards
Total Collapsed Volume of Piping	1,113 cubic yards
Total Collapsed Volume of:	
Concrete	43,484 cubic yards
Wood	333 cubic yards
Tile	5,494 cubic yards
Brick	6,162 cubic yards
Masonry/Cinder Block	10,725 cubic yards
Corrugated Metal	2,007 cubic yards
Corrugated Asbestos	3,403 cubic yards
Asbestos Board	1,085 cubic yards
Fiberglass	0 cubic yards
Asphalt Shingle	914 cubic yards
Built-Up/Hot Tar	372 cubic yards
Sheet Metal	286 cubic yards
Wood and Asphalt	157 cubic yards
Scrap Metal Salvage Volume	5,806 cubic yards
Total Structure Footprint	882,562 square feet
Capping Area	173,117 square feet
Total Structure Perimeter with 10-foot Buffer	57,102 linear feet
Treatable Surface Area for Sand Blasting and Vacuum Dusting	503,652 square feet
Treatable Surface Area for Steam Cleaning	367,433 square feet
Interior Surface Area	2,528,608 square feet
Exterior and Interior Surface Area	3,812,865 square feet

Note: Group contains 37 structures added since the 1987 Task 24 report (EBASCO 1987), for which material quantities were not calculated.

Table 3.5-3 Material Volumes for No Future Use, Agent History Medium Group

Total Number of Structures	67
Total Standing Volume	573,624 cubic yards
Total Collapsed Volume	67,447 cubic yards
Total Collapsed Volume of Process Equipment	5,330 cubic yards
Total Collapsed Volume of Piping	1,188 cubic yards
Total Collapsed Volume of:	
Concrete	45,543 cubic yards
Wood	218 cubic yards
Tile	2,260 cubic yards
Brick	2,170 cubic yards
Masonry/Cinder Block	12,284 cubic yards
Corrugated Metal	2,819 cubic yards
Corrugated Asbestos	1,151 cubic yards
Asbestos Board	500 cubic yards
Fiberglass	0 cubic yards
Asphalt Shingle	136 cubic yards
Built-Up/Hot Tar	289 cubic yards
Sheet Metal	3 cubic yards
Wood and Asphalt	74 cubic yards
Total Structure Footprint	512,407 square feet
Total Structure Perimeter with 10-foot Buffer	24,129 linear feet
Treatable Surface Area for Sand Blasting and Vacuum Dusting	358,159 square feet
Treatable Surface Area for Steam Cleaning	260,580 square feet
Interior Surface Area	1,667,905 square feet
Exterior and Interior Surface Area	2,449,922 square feet

4.0 FUTURE USE, NO POTENTIAL EXPOSURE

Structures in the Future Use, No Potential Exposure Medium Group include those structures with a history of administrative, utility, or support use; those currently in use; and those with a continued usefulness to RMA following remediation. The structures in this medium group are outside the CERCLA process; therefore, the only alternative retained for analysis in the DAA is the No Action alternative.

4.1 ALTERNATIVE 1: NO ACTION

4.1.1 Description of Alternative

The No Action alternative involves no further action under the CERCLA process. Any actions appropriate for the structures in this medium group will occur outside the CERCLA process and will not be considered as part of the feasibility study (FS) process.

4.1.2 Analysis of Alternative

The seven EPA evaluation criteria (see the Executive Summary) do not apply to the Future Use, No Potential Exposure Medium Group because the medium group falls outside the CERCLA process.

5.0 NO FUTURE USE, NONMANUFACTURING HISTORY

Structures in the No Future Use, Nonmanufacturing History Medium Group include those structures with a history of administrative, utility, or support use; those not involved in manufacturing operations; and those not collocated with structures involved in manufacturing operations. In contrast to the future use structures, these structures will not have a continued usefulness to RMA following remediation. The structures in this medium group are outside the CERCLA process; therefore, the only alternative retained for analysis in the DAA is no action. The structures in this medium group will be handled in a manner similar to the Future Use, No Potential Exposure Medium Group with respect to the FS process.

5.1 ALTERNATIVE 1: NO ACTION

5.1.1 Description of Alternative

The No Action alternative involves no further action under the CERCLA process. Any actions appropriate for the structures in this medium group will occur outside the CERCLA process and will not be considered as part of the FS process. Since these structures are not anticipated to have a future use, they may be removed and disposed.

5.1.2 Analysis of Alternative

The seven EPA evaluation criteria (see the Executive Summary) do not apply to the No Future Use, Nonmanufacturing History Medium Group because this medium group falls outside the CERCLA process.

6.0 NO FUTURE USE, MANUFACTURING HISTORY–PROCESS HISTORY SUBGROUP

Structures in the No Future Use, Manufacturing History–Process History Subgroup include those structures that were directly involved with manufacturing at RMA, or those that were sites of documented chemical spills. The use histories of the structures in this subgroup include pesticide and various chemical manufacturing, chemical storage, and chemical handling activities. No action, containment, treatment, and disposal options are considered among the alternatives for this medium group. Each alternative has been described and analyzed according to the seven EPA evaluation criteria (see the Executive Summary). As described in Section 2, most of the alternatives and analyses developed for the structures medium are very similar. Accordingly, following the description and analysis of the No Action and Containment alternatives (Sections 6.1 and 6.2), Section 6.3 presents a description of the general alternative for this medium group (demolition, and landfilling), as well as a general analysis of the alternative against the seven EPA evaluation criteria. The subsequent descriptions and analyses (Sections 6.4 through 6.13) focus on the differences each alternative has from the general alternative. Refer to Table 6.0-1 for the comparative analysis in tabular format. ARARs are discussed for each alternative as part of the analysis of alternative section. Sampling for this subgroup is described in Section 2.4.

It was assumed that PCBs, ACM, process equipment, piping, and tanks will be handled under the scope of other ongoing actions. It was assumed that all ACM, PCBs, process equipment, piping, and tanks are removed from the structures prior to initiating the structures remediation. If any of these items are encountered during the structures remediation, it will be handled as an integral part of the remediation process. Moreover, the cost of removal and disposal of any of these was assumed to be handled under the appropriate action and was not included as part of the remediation costs developed for the DAA. No structural steel or sheet steel will be salvaged from the structures in the Process History Subgroup due to the cost associated with cleaning the material and the relatively low salvage value.

6.1 ALTERNATIVE 1: NO ACTION

6.1.1 Description of Alternative

The No Action alternative involves no further action beyond existing measures; it may be applicable to the Process History Subgroup only if IRAs preceding the Record of Decision (ROD) have adequately remediated the structures in this subgroup. Given the use histories of the structures and the interaction between alternatives developed for the structures medium and those developed for the soils medium, it was assumed that some remedial activity has to be undertaken.

6.1.2 Analysis of Alternative

6.1.2.1 Overall Protection of Human Health and the Environment

Alternative 1 does not provide protection to human health and the environment since the potential for exposure to contamination remains unchanged.

6.1.2.2 Compliance with ARARs

Action-specific ARARs do not apply to this alternative since no action is taken. This alternative complies with location-specific ARARs.

6.1.2.3 Long-Term Effectiveness and Permanence

Alternative 1 does not provide long-term effectiveness or permanence. The residual risk increases with time because there is a greater chance for the release of contaminants as the structures deteriorate. The current access controls are inadequate for the long term and the habitat remains unchanged.

6.1.2.4 Reduction of TMV

Alternative 1 does not reduce contaminant TMV since this alternative does not include treatment or containment.

6.1.2.5 Short-Term Effectiveness

Since there are no actions taken under this alternative, no worker or community protection is necessary and there are no environmental impacts caused by the remediation. Alternative 1 may not achieve remedial action objectives (RAOs).

6.1.2.6 Implementability

Alternative 1 is not administratively feasible because further deterioration of the structures may pose a physical and chemical hazard to human health and the environment.

6.1.2.7 Cost

The cost of this alternative is $0.00.

6.2 ALTERNATIVE 2: PIPE PLUGS, LOCKS/BOARDS/FENCES/SIGNS

6.2.1 Description of Alternative

Alternative 2 includes plugging pipes within the structure to immobilize contaminants and using a combination of locks, boards, fences, and signs to prevent access to the structure. Alternative 2, as retained in the DSA, included the option of filling entire rooms or structures with grout to immobilize contamination. The initial DAA analysis determined that filling a whole building with grout had a high cost and was difficult to implement without offering significantly better permanence, protectiveness, or reduction in TMV compared to pipe plugs in combination with locks, boards, fences, and signs. Therefore, only pipe plugs are considered as part of Alternative 2. Pipe plugs are described in detail in the Technology Description Volume, Section 13, and locks, boards, fences, and signs are described in the Technology Description Volume, Section 3.

Before Alternative 2 can be implemented, each structure in this subgroup must be visually examined. An interior and exterior examination is performed to determine the structural integrity of the building. If any of the structures are found to be unsafe for the implementation of Alternative 2, the structures are repaired to ensure the safety of workers in and around the structures. The necessary repairs for many of the structures in this subgroup may represent a

significant effort. It was assumed that there is no ACM associated with these structures at the time of remediation since the scope of the Asbestos IRA, currently in progress, is to remove all ACM from structures. This task is scheduled to be completed prior to the structures remediation. The visual inspection of the structures also determines whether there is any residual ACM.

Following the examination and repair of the structure, pipe plugging is implemented as necessary. Any process piping is filled with grout to immobilize and contain contaminants. Concurrent with the pipe plugging operations, locks, boards, fences, and signs are installed as appropriate to prevent access to the structure. Due to the unique configuration and differing accessibility of structures in this subgroup, the types and quantities of locks, boards, fences, or signs are evaluated separately for each structure.

Since Alternative 2 is a containment option, the structures remain intact indefinitely; therefore, inspections and repairs are performed on a regular basis as part of this alternative.

6.2.2 Analysis of Alternative

6.2.2.1 Overall Protection of Human Health and the Environment

Alternative 2 is somewhat protective of human health and the environment because it prevents contaminant migration and eliminates contact with contaminants by plugging pipes and preventing access to the structures. Although the contaminants in pipes are immobilized and access to the structure is controlled, overall protectiveness is limited because the structures remain intact and no contaminants are removed from the structure. Further deterioration of the structures increases the physical hazards related to the structures.

6.2.2.2 Compliance with ARARs

Alternative 2 complies with applicable action- and location-specific ARARs. Action-specific ARARs regarding pipe plugging, which are unique to this alternative, are presented in the Technology Description Volume, Appendix A, Table A-25. Other applicable action-specific ARARs related to this alternative include institutional controls (Technology Description Volume,

Appendix A, Table A-35). ARARs regarding institutional controls address access restrictions, land use/deed restrictions, and monitoring. The location-specific ARARs applicable to this alternative are listed in the Structures DSA, Volume I, Appendix A, Table 2A.

6.2.2.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence of this alternative is questionable. There is moderate residual risk since the structures remain intact and no contaminants are removed from the structures. The potential exists for migration of contaminants remaining in the structures.

The controls are adequate assuming that preventive maintenance and long-term monitoring, which prevent the re-establishment of contaminant migration pathways out of the pipes and structure and the subsequent exposure to humans or wildlife, occur for an indefinite period of time. Maintenance and monitoring for an indefinite period of time, however, is impractical.

The habitat remains unchanged and may actually be reduced for species that use the structures as part of their habitat. However, some burrowing or invasive species (e.g., rodents, insects) may eventually regain access to the structure and re-establish habitat.

6.2.2.4 Reduction of TMV

Plugging pipes in combination with locks, boards, fences, and signs to prevent access is effective in reducing mobility of contaminants; however, it does not reduce volume or toxicity of any contaminants present. The volume of contaminated materials is slightly increased by exposing the grout to contaminants resident in the pipes. Toxicity remains unchanged because contaminants are immobilized in their present form without undergoing treatment. The mobility reduction is reversible should the access restrictions or pipe plugs fail.

Pipe plugging produces a very small quantity of solid waste consisting of used grout that could potentially be hazardous. Locks, boards, fences, and signs produce no treatment residuals.

6.2.2.5 Short-Term Effectiveness

Standard worker protection is necessary during pipe plugging and access restriction operations. Alternative 2 has a minimal effect on the community, and no additional effect on habitat or the environment during implementation. It is anticipated that RAOs would be attained within 1 year under this alternative.

6.2.2.6 Implementability

Alternative 2 is both administratively and technically implementable, with services and materials readily available. Pipe plugging is technically simple, relatively inexpensive, and easily implementable for most piping runs. Services and materials for structural repair as well as for the locks, boards, fences, and signs are readily available.

6.2.2.7 Cost

It was assumed for cost-estimating purposes that pipe plugs are applied to the entire piping volume of the structure under remediation. The cost of Alternative 2 includes annual ambient air monitoring of the structure performed a dedicated high-volume air sampler. Alternative 2 has been applied to 365 structures in the Process History Subgroup. The present worth cost of Alternative 2 is approximately $38,300,000. These costs include monitoring and long-term maintenance for a 30-year period, after which the need for maintenance and monitoring is re-evaluated. It is anticipated that maintenance and monitoring will continue past the 30-year period at an approximate annual cost of $338,000.

6.3 GENERAL ALTERNATIVE: DEMOLITION, CONTAINMENT

As described in Sections 2 and 6, most of the alternatives developed for this medium group are very similar, i.e., they incorporate the options of demolition and landfilling. This section describes how these process options are applied, in general, to the alternatives. Subsequent discussions will focus on the differences of the developed alternatives.

6.3.1 Description of Alternative

The general alternative for this medium group includes demolishing the structure, and stockpiling, transporting, and disposing the debris. Demolition and transportation are described in detail in Section 4 and containment in Section 6 of the Technology Description Volume.

Before any of the alternatives can be implemented, each structure in the medium group must be visually examined. An interior and exterior examination is used to determine the structural integrity of the building. If any of the structures are found to be unsafe for implementation of the alternatives, the structures are repaired to ensure the safety of workers in and around the structures. The necessary repairs for many of the structures may be significant. It was assumed that 10 percent of structures need to be repaired. In addition, it was assumed that there is no ACM associated with the structures at the time of remediation since the scope of the Asbestos IRA, currently in progress, is to remove all ACM from structures. (The visual inspection of the structures determines whether there is any remaining ACM.) The asbestos IRA is scheduled to be completed prior to structures remediation. It was also assumed that all PCBs, process equipment, piping, and tanks are removed prior to the structures remediation.

Once the structure is determined to be safe for remediation activities (based on inspections and repairs), demolition commences. In the DSA, detonation and dismantling were both retained as possible demolition techniques. The initial DAA analysis determined, however, that detonation was not as widely applicable as dismantling, and that it would not allow efficient waste segregation. In addition, detonation is costly and poses a greater threat to the community than does dismantling because of the large, uncontrolled amount of dust that is released, and to workers because of the uncontrolled nature of the process leading to the potential release of contaminants. Therefore, dismantling is the demolition technique used for all of the alternatives.

Dismantling consists of a combination of techniques using equipment such as a ball and crane or a clamshell, or by performing piece-by-piece disassembly, sawing, or crushing. Standard dust-control measures are used throughout the demolition process to protect workers and the

community. This includes wetting the working area with water or surfactants and covering the area around the structure with gravel or asphalt. Materials not salvaged are placed in a bermed, dirt, or concrete staging area. If necessary, the debris is segregated into potentially hazardous and nonhazardous waste as the building is dismantled and placed in separate containment areas. The debris is sized for disposal concurrent with stockpiling. In general, debris is sized no larger than 1- by 1-ft pieces when it is to be disposed in a landfill or used as fill. Rebar does not have to be separated from concrete, but rebar should not be exposed. The debris is transported by truck to the disposal site. For the Process History Subgroup, 30 percent of the structure was assumed to be potentially hazardous. For the Non-Process History Subgroup (Section 7), all of the debris was assumed to be potentially nonhazardous. The varying requirements for on-post versus off-post disposal and for hazardous versus nonhazardous disposal are discussed below for each alternative. For most alternatives involving treatment, the disposal option is on-post nonhazardous waste landfilling. However, the debris could also be consolidated and used as fill in a containment area (as in Alternative 21a), and aggregate may be used as biota barrier in capping and consolidation alternatives. Once the structures and debris are removed, the site is reclaimed by backfilling and grading the area. In some cases, the area may be capped and revegetated with native plants and grasses as part of soils remediation. It is assumed that 80 percent of the structures are located in areas that are revegitated by the soils medium. In those areas the structures sites will be backfilled and graded only. The remaining 20 percent of the structures sites will be backfilled, graded, covered with topsoil and revegitated as part of the structures remediation.

6.3.2 Analysis of Alternative

6.3.2.1 Overall Protection of Human Health and the Environment

Since the structures are demolished and removed and the debris is contained by containment, the alternatives are protective of human health and the environment. The degree of protection may change slightly based on the specific treatments used and the type of disposal. In general, however, overall protectiveness of the common alternatives does not change significantly.

6.3.2.2 Compliance with ARARs

Action-specific ARARs that apply to all of the alternatives in the Process History Subgroup include those related to demolition of structures (Technology Description Volume, Appendix A, Table A-3), conventional excavation and backfill (Technology Description Volume, Appendix A, Table A-1), and transportation of wastes (Technology Description Volume, Appendix A, Table A-34). ARARs regarding demolition address worker protection, wildlife protection, noise control, and air emission controls. ARARs regarding excavation and backfill address worker protection, protection of wildlife, noise abatement, air emission control, waste characterization and management, and groundwater injection. ARARs regarding transportation of wastes address transportation of hazardous wastes, both on and off post. All alternatives, with the exception of the No Action alternative, are in compliance with these action-specific ARARs. Location-specific ARARs are included in the Structures DSA, Volume I, Appendix A, Table 2A. Unique action-specific ARARs that apply to individual alternatives within the subgroup are described below.

6.3.2.3 Long-Term Effectiveness and Permanence

Since the debris is contained, the residual risk is low. The controls are adequate so long as long-term maintenance and monitoring is performed regularly at the disposal area. Although the overall habitat is improved because the structures are removed and the site is reclaimed, it is limited at any on-post disposal areas and at capped areas because burrowing animals are excluded.

6.3.2.4 Reduction of TMV

Containment of structural debris through containment reduces the mobility of contaminants, but does not change the toxicity or volume of any contaminants present. In general, the reduction in contaminant mobility is permanent, but if the integrity of the disposal area is breached, the reduction in contaminant mobility is reversed. Long-term monitoring and maintenance of the disposal area helps ensure the permanence of mobility reduction. Containment of structural debris produces no treatment residuals.

6.3.2.5 Short-Term Effectiveness

Standard worker protection is necessary during demolition, transportation, and containment. The greatest potential threat to the community is the migration of potentially contaminated dust off post. Dust controls must be implemented throughout the remediation activities to minimize the quantity of dust produced. Assuming adequate dust control measures are used, the impact to the environment is minimal since the remedial actions are short in duration. In general, RAOs are achieved in less than 5 years.

6.3.2.6 Implementability

Demolition, transportation, and containment are standard, reliable technologies. They are technically feasible, with services and materials readily available. Demolition, transportation, and containment are also administratively feasible, but there are long-term liability concerns associated with off-post disposal.

6.3.2.7 Cost

The costs are unique to each alternative and are discussed individually in the following sections.

6.4 ALTERNATIVE 8: HOT GAS, DISMANTLING, SALVAGE, ON-POST NONHAZARDOUS WASTE LANDFILL

6.4.1 Description of Alternative

Alternative 8 includes administering in situ hot gas treatment, dismantling the structure, salvaging decontaminated scrap metal, and transporting and disposing the resulting nonhazardous debris in an on-post nonhazardous waste landfill. Hot gas treatment is described in the Technology Description Volume, Section 8.

In situ hot gas treatment for structures is limited to those areas of a structure where production operations or documented spills occurred. Hot gas is an aggressive treatment that is limited to organic contaminants on nonflammable surfaces such as metal and masonry. Hot gas treatment consists of injecting hot gases into a sealed room to thermally desorb contaminants from

structural surfaces. Pre-treatment of the structure includes isolating the treatment area and constructing off gas treatment and collection systems. The treatment produces a gaseous sidestream in which the entrained contaminants are cooled and treated by incineration. Due to the limited applicability of hot gas treatment, treatment by this method may not be possible for some portions of some structures.

6.4.2 Analysis of Alternative

6.4.2.1 Overall Protection of Human Health and the Environment

Due to the limited applicability of hot gas treatment, Alternative 8 may not fully treat contaminated structures. However, this alternative is protective of human health and the environment because the structural debris is disposed in a controlled landfill.

6.4.2.2 Compliance with ARARs

The alternative complies with action- and location-specific ARARs. ARARs regarding hot gas treatment of structures are presented in the Technology Description Volume, Appendix A, Table A-15, and ARARs regarding nonhazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-9.

6.4.2.3 Long-Term Effectiveness and Permanence

If the contaminants of interest are not successfully treated by hot gas, residual risk may not be lowered as compared to containment without treatment. As long as the landfill is maintained and monitored, however, this alternative has adequate long-term effectiveness and permanence.

6.4.2.4 Reduction of TMV

This alternative is effective in irreversibly reducing organic contaminant TMV through the hot gas treatment process and treatment of contaminated off gases. The TMV of inorganic contaminants are not affected by hot gas treatment.

6.4.2.5 Short-Term Effectiveness

Extensive worker protection is required during hot gas treatment due to the aggressive nature of the process. The potentially hazardous off gases must be collected and treated to ensure the safety of the workers and the community. Hot gas treatment has the potential to cause additional environmental impacts due to the chance of fire during treatment. RAOs are achieved within 1 to 3 years.

6.4.2.6 Implementability

Implementation of hot gas treatment is limited to treating organic contaminants. The suitability of this option must be determined on a case-by-case basis due to the limited number of structures and compounds to which this treatment may be applied. Materials undergoing treatment must be stable at the high operating temperatures of the process and combustible materials must be removed before application of the process. The ability to seal the structure may limit the effectiveness of hot gas treatment due to heat loss or gas leakage through gaps in the structure. Structural repair to eliminate leakage may be required prior to treatment. In addition, the complexity of the physical configuration of the structure (i.e., the inaccessibility of corners or recesses) may prevent the even distribution of heat, and the physical properties of the structure may reduce the diffusion of contaminants into the gas stream (e.g., smooth steel may release contaminants more readily than porous concrete).

To date, hot gas technology has only been developed at pilot scale; its effectiveness at full scale is unknown. In addition, it is not a commercially available technology and technical expertise is limited. The alternative is administratively feasible.

6.4.2.7 Cost

The cost of Alternative 8 includes incineration treatment of the emitted off gases. The cost is based on the assumption that only interior surfaces are treated. It is likely that some additional cost may be incurred to seal or repair structures before treatment. There are 365 structures amenable to treatment by this process. The structural debris is to be loaded on trucks and

transported to the on-post landfill located between North Plants and Basin F; therefore, the material is hauled an average of 4 miles. The present worth cost of this alternative, including transportation, is approximately $119,000,000.

6.5 ALTERNATIVE 9: VACUUM DUSTING, DISMANTLING, SALVAGE, ON-POST NONHAZARDOUS WASTE LANDFILL

6.5.1 Description of Alternative

Alternative 9 includes in situ vacuum dusting, dismantling the structure, salvaging decontaminated scrap metal, transporting and disposing the resulting nonhazardous debris in an on-post nonhazardous waste landfill, and backfilling the structure excavation. Vacuum dusting is discussed in the Technology Description Volume, Section 13.

In situ vacuum dusting removes dust and particulates from structural surfaces. The dust and particulates are collected on a high-efficiency particulate (HEPA) filter that is then drummed and disposed. No pre-treatment of the structure is necessary other than to ensure the safety of the workers and to ensure that all surfaces to be treated are accessible. Vacuum dusting does not remove any contamination that is physically or chemically bound to a surface. Due to this limitation, some contamination may not be removed using this method.

6.5.2 Analysis of Alternative

6.5.2.1 Overall Protection of Human Health and the Environment

Alternative 9 is protective of human health and the environment because contaminated dust is removed and the structural debris is disposed in a contained, controlled landfill.

6.5.2.2 Compliance with ARARs

Alternative 9 complies with action- and location-specific ARARs. The ARARs regarding vacuum dusting are presented in the Technology Description Volume, Appendix A, Table A-26, and ARARs regarding nonhazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-9.

6.5.2.3 Long-Term Effectiveness and Permanence

The addition of vacuum dusting prior to landfilling somewhat lowers the residual risk related to contaminated dust in structures. Residual risk is not reduced for structures with extensive nonparticulate contamination. As long as the landfill is maintained, this alternative has adequate long-term protectiveness and permanence.

6.5.2.4 Reduction of TMV

Alternative 9 is effective in reducing the mobility of particulate contaminants through vacuum dusting and in reducing the mobility of residual contamination associated with structures through containment; however, it does not reduce volume or toxicity. Vacuum dusting produces a low-volume solid waste stream that must be treated and disposed. There are 365 structures amenable to this option.

6.5.2.5 Short-Term Effectiveness

The complexity of the physical configuration of the structure could limit the effectiveness of vacuum dusting due to the inaccessibility of corners or recesses. Standard worker protection is required during vacuum dusting. Implementation of this alternative is not anticipated to have any adverse affects on the environment. RAOs are achieved within 1 to 3 years.

6.5.2.6 Implementability

Alternative 9 is both technically and administratively feasible for structures in this medium group. Vacuum dusting is limited to removing contaminants associated with dusts or particulates. As a result, the effectiveness of this alternative for all structures in this subgroup is limited and must be evaluated on a structure-by-structure basis. Vacuum dusting is a proven technology, with materials and services readily available.

6.5.2.7 Cost

The cost of Alternative 9 assumes treatment and disposal of generated waste following vacuum dusting and demolition and that only interior surfaces are treated by vacuum dusting. This

alternative treats 365 structures. The present worth cost of this alternative is approximately $49,700,000, including transportation.

6.6 ALTERNATIVE 9a: STEAM CLEANING, DISMANTLING, SALVAGE, ON-POST NONHAZARDOUS WASTE LANDFILL

6.6.1 Description of Alternative

Alternative 9a includes in situ steam cleaning, dismantling the structure, salvaging decontaminated scrap metal, transporting and consolidating the resulting nonhazardous debris in an on-post nonhazardous waste landfill, and backfilling the structure excavation. Steam cleaning is discussed in the Technology Description Volume, Section 13.

In situ steam cleaning for structures is limited to areas of a structure where production operations or documented spills occurred. Steam cleaning removes contaminants from building materials and surfaces using heated water applied under pressure, but is limited to nonporous surfaces such as metal and concrete. The treatment produces a liquid sidestream containing the removed contaminants; this sidestream is treated on site by filtration and carbon adsorption and the liquid is recycled back into the steam cleaning process. This minimizes the volume of waste produced and the amount of water needed for treatment. Pre-treatment of the structure includes containing the treatment area and collecting and treating the liquid waste produced. Some portions of the structure with potential contamination may not be amenable to this treatment since steam cleaning is not applicable to porous surfaces. In addition, contamination that has migrated below the floor surface of materials to be steam cleaned cannot be removed by this process.

6.6.2 Analysis of Alternative

6.6.2.1 Overall Protection of Human Health and the Environment

Although steam cleaning only treats contaminants on nonporous surfaces only, Alternative 9a is protective of human health and the environment because the structural debris is disposed in a controlled, contained landfill.

6.6.2.2 Compliance with ARARs

Alternative 9a complies with action- and location-specific ARARs. ARARs regarding steam cleaning are presented in the Technology Description Volume, Appendix A, Table A-27, and ARARs regarding nonhazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-9.

6.6.2.3 Long-Term Effectiveness and Permanence

Alternative 9a lowers the residual risk for structures with contamination on nonporous surfaces compared to containment without treatment.

6.6.2.4 Reduction of TMV

Steam cleaning irreversibly reduces the mobility and volume of contaminants on nonporous surfaces. Contaminants exhibiting toxicity are simply transferred from the structure to the wastewater, which must be treated or disposed.

6.6.2.5 Short-Term Effectiveness

Worker exposure controls are needed during steam cleaning. Standard worker protection is required during steam cleaning and demolition operations, with an emphasis on dust control during demolition. Implementation of this alternative is not anticipated to have any additional adverse affects on the environment or surrounding community. It is anticipated that RAOs are achieved in 1 to 3 years.

6.6.2.6 Implementability

Alternative 9a is both technically and administratively feasible for structures in this medium group. Implementation of the steam cleaning option is limited to removing surface contaminants associated with nonporous materials. Although steam cleaning can be customized to include solvents or grit to enhance removal efficiencies, the complexity of the physical configuration of the structure could limit the effectiveness of this treatment due to the inaccessibility of corners or recesses. As a result, the effectiveness of this alternative for all structures in this subgroup

must be evaluated on a structure-by-structure basis. Steam cleaning is a proven technology, with materials and services readily available.

6.6.2.7 Cost

The cost of Alternative 9a assumes that only interior surfaces are treated and that the wastewater generated during the process is treated and disposed. There are 365 structures amenable to treatment by this option. The present worth cost of this alternative is approximately $50,300,000, including transportation.

6.7 ALTERNATIVE 10: SAND BLASTING, DISMANTLING, SALVAGE, ON-POST NONHAZARDOUS WASTE LANDFILL

6.7.1 Description of Alternative

Alternative 10 includes in situ sand blasting, dismantling the structure, salvaging decontaminated scrap metal, consolidating and transporting the resulting nonhazardous debris to an on-post non-hazardous waste landfill, and backfilling the structure excavation. Sand blasting is discussed in the Technology Description Volume, Section 13.

In situ sand blasting for structures is limited to areas of a structure where production operations or documented spills occurred. Sand blasting consists of the physical removal of contaminated surfaces via abrasion and is effective at removing surface contamination that has not penetrated the material to a depth greater than 1/2 inch. Sand blasting is applicable to most surfaces except wood, glass, or certain polymers (e.g., transite or Plexiglas). Sand blasting is an acceptable best demonstrated available technology (BDAT) for both metal and nonmetal contaminants in debris regulated by RCRA. The treatment produces a solid sidestream containing used grit, removed surface materials, and removed contaminants. The grit is separated from the other particles on site and recycled back into the sand blasting process. This minimizes the volume of waste produced and the amount of grit needed for treatment. Pre-treatment of the structure includes containing the treatment area and collecting and treating the solid waste produced. Sand blasting is the most widely applicable in situ treatment with respect to both structural materials and

potential contaminants, although some portions of the structure with potential contamination may not be able to be treated by this method since sand blasting is not applicable to certain surfaces.

6.7.2 Analysis of Alternative

6.7.2.1 Overall Protection of Human Health and the Environment

Sand blasting increases the protection of human health and the environment compared to containment alone by removing the contaminated surfaces of most structural materials.

6.7.2.2 Compliance with ARARs

Alternative 10 complies with action- and location-specific ARARs. The ARARs regarding sand blasting are presented in the Technology Description Volume, Appendix A, Table A-28, and those for nonhazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-9.

6.7.2.3 Long-Term Effectiveness and Permanence

Sand blasting lowers residual risk by removing surface contamination, and it satisfies the BDAT standard for both metal and nonmetal contaminants associated with structural material. However, the effectiveness of this alternative varies based on the accessibility of the structural surfaces to the sand blasting equipment.

6.7.2.4 Reduction of TMV

Sand blasting irreversibly reduces the mobility and volume of surface contamination. The treatment is not applicable to wood, glass, and certain polymers such as transite or plexiglas. The treatment residuals, consisting of a solid waste stream containing any removed contaminants from the structure and grit, must be characterized and properly disposed. Contaminant toxicity can be reduced if the waste stream is treated. There are 519,004 SF of treatable surfaces amenable to this option.

6.7.2.5 Short-Term Effectiveness

Standard worker protection is required during sand blasting operations. The additional environmental risks are low so long as the contaminated grit can be effectively contained and collected. RAOs are attained within 1 to 3 years.

6.7.2.6 Implementability

Alternative 10 is both technically and administratively feasible for structures in this subgroup. Sand blasting is limited to removing near-surface contaminants on most surfaces. Implementability of this alternative varies from structure to structure. The complexity of the physical configuration of the structure could limit the degree of treatment due to the inaccessibility of corners or recesses. Depending on the configuration of each structure, therefore, not all contaminated surfaces may be treated. Sand blasting is a proven technology, with materials and services readily available.

6.7.2.7 Cost

The cost of Alternative 10 assumes that removed materials and spent abrasive are disposed in an on-post nonhazardous waste landfill or consolidated as on-post fill and that only interior surfaces are treated. There are 365 structures that are amenable to treatment under this alternative. The present worth cost of this alternative is $51,900,000, including transportation.

6.8 ALTERNATIVE 12: DISMANTLING, SALVAGE, OFF-POST ROTARY KILN INCINERATION, OFF-POST HAZARDOUS WASTE LANDFILL

6.8.1 Description of Alternative

Alternative 12 includes dismantling the structure, salvaging decontaminated scrap metal, transporting the debris to an on-post transfer station, backfilling the structure excavation, transporting and incinerating the debris in an off-post rotary kiln incinerator, and landfilling the incinerator ash in the off-post hazardous waste landfill. Incineration is discussed in the Technology Description Volume, Section 7.

Alternative 12 treats all nonsalvagable material through off-post incineration. This requires that the debris be sized to less than 1- by 1-ft pieces. All rebar is removed from concrete using an on-site crusher. Off-post transportation requires the waste to be manifested in accordance with Department of Transportation (DOT), RCRA, and state requirements. Certificates of destruction are provided for all waste that is to be incinerated. It was assumed that the resulting ash is disposed in an off-post hazardous waste landfill, with transportation between the incinerator and the landfill being the responsibility of the incinerator operator.

6.8.2 Analysis of Alternative

6.8.2.1 Overall Protection of Human Health and the Environment

Alternative 12 offers increased protection of human health and the environment compared to containment without treatment through incineration of the debris and containment in an off-post hazardous waste landfill.

6.8.2.2 Compliance with ARARs

Alternative 12 complies with action- and location-specific ARARs. ARARs regarding off-post rotary kiln incineration are presented in the Technology Description Volume, Appendix A, Table A-12, and ARARs regarding hazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-8.

6.8.2.3 Long-Term Effectiveness and Permanence

This alternative has a very low residual risk, effectively destroying all organic contaminants (although inorganic contaminants are not treated). There are adequate controls for landfilled ash—which is to be disposed by the incinerator operator—but there is no direct control over long-term maintenance and monitoring. Wildlife habitat is improved at the site.

6.8.2.4 Reduction of TMV

This alternative irreversibly reduces contaminant TMV through the complete thermal destruction of organic contaminants. Off gases produced during the incineration process must be treated.

The rotary kiln, the most common type of hazardous waste incinerator, most effectively processes demolition debris. This process is effective in treating organic contaminants, but ineffective in treating inorganic contaminants. Air emissions from the process must be treated before they are discharged to the atmosphere.

6.8.2.5 Short-Term Effectiveness

No additional worker protection is necessary since incineration occurs off post. Since the waste is being transported a significant distance (at least several hundred miles) off post, there is a much greater potential for environmental impacts such as accidents during transportation. RAOs are attained within 1 to 3 years.

6.8.2.6 Implementability

This alternative is technically and administratively feasible, with materials and services readily available, although technical feasibility concerns include extensive materials processing and limited reduction of total material volume, and administrative feasibility concerns include availability of commercial incineration capacity and long-term liability associated with off-post incineration and disposal. Off-post treatment and disposal options offer no direct control over the processes and the long-term monitoring and maintenance of the landfill.

6.8.2.7 Cost

For cost-estimating purposes, it was assumed that dismantling is used to demolish the structure and that the entire structure volume is shreddable and is incinerated. There are 365 structures amenable to this alternative. Costs include transportation to an off-post incinerator and subsequent disposal by the incinerator operator in a hazardous waste landfill. The present worth cost for this alternative is approximately $528,000,000, making Alternative 12 the most expensive alternative for this subgroup.

6.9 ALTERNATIVE 13: DISMANTLING, SALVAGE, ON-POST ROTARY KILN INCINERATION, ON-POST NONHAZARDOUS WASTE LANDFILL

6.9.1 Description of Alternative

Alternative 13 includes dismantling the structure, salvaging decontaminated scrap metal, transporting the debris to the on-post rotary kiln incinerator, disposing the resulting ash in an on-post nonhazardous waste landfill, and backfilling the structure excavation. This alternative is very similar to Alternative 12 (Section 6.8), except that the incineration takes place on post and disposal occurs in an on-post nonhazardous waste landfill.

This alternative treats the materials by on-post incineration and requires that the debris be sized to less than 1- by 1-ft pieces. All rebar is removed from concrete using an on-site crusher.

6.9.2 Analysis of Alternative

6.9.2.1 Overall Protection of Human Health and the Environment

Alternative 13 is protective of human health and the environment by destroying organic contaminants through incineration and by containing debris in an on-post landfill. On-post treatment and disposal offers direct control of activities, which makes this alternative more protective than Alternative 12.

6.9.2.2 Compliance with ARARs

Alternative 12 complies with action- and location-specific ARARs. ARARs regarding to on-post rotary kiln incineration are presented in the Technology Description Volume, Appendix A, Table A-11, and ARARs regarding nonhazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-9.

6.9.2.3 Long-Term Effectiveness and Permanence

Since the incinerated debris was assumed to be nonhazardous, there is, in general, low residual risk associated with Alternative 13. The residual risk may increase, however, if there are inorganic contaminants present in the structural materials. Adequate and reliable controls are

ensured by long-term monitoring and maintenance of the on-post landfill. Wildlife habitat is temporarily eliminated at the incineration site.

6.9.2.4 Reduction of TMV

This alternative irreversibly reduces contaminant TMV through the complete thermal destruction of organic contaminants. It is ineffective in treating inorganic contaminants. Off gases produced during the incineration process must be treated. The rotary kiln, currently the most conventional design type for hazardous waste incineration, most effectively processes demolition debris. Air emissions from the process must also be treated before discharge to the atmosphere.

6.9.2.5 Short-Term Effectiveness

Worker protection is necessary for incineration operation and off gases in the air emissions must be effectively controlled. RAOs are achieved in 1 to 5 years.

6.9.2.6 Implementability

This alternative is administratively and technically feasible, with materials and services readily available. However, this alternative may be difficult to implement due to the need for material processing, possibly extensive fuel requirements, and potential air emissions and ash disposal concerns for structures contaminated with inorganics. Furthermore, regulatory and community acceptance is a potential concern.

6.9.2.7 Cost

It was assumed that the entire structure volume is shredded and incinerated. There are 365 structures that are amenable to treatment under this alternative. The present worth cost for this alternative is approximately $95,800,000.

6.10 ALTERNATIVE 19: DISMANTLING, SALVAGE, ON-POST HAZARDOUS WASTE LANDFILL

6.10.1 Description of Alternative

Alternative 19 includes dismantling the structure, salvaging decontaminated scrap metal, transporting the debris to an on-post hazardous waste landfill, and backfilling the structure excavation. This alternative is basically the same as the general alternative described in Section 6.3 since there is no additional treatment involved.

6.10.2 Analysis of Alternative

6.10.2.1 Overall Protection of Human Health and the Environment

Without treatment, the disposal of the structural debris in an on-post hazardous waste landfill offers greater protection of human health and the environment than does disposal of the debris in a nonhazardous waste landfill. If the debris is nonhazardous, this alternative is overprotective.

6.10.2.2 Compliance with ARARs

This alternative complies with action- and location-specific ARARs. ARARs regarding to hazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-8.

6.10.2.3 Long-Term Effectiveness and Permanence

The disposal of the structured debris in an on-post hazardous waste landfill results in low residual risk.

6.10.2.4 Reduction of TMV

Since there is no treatment involved in this alternative, there is no reduction in contaminant toxicity or volume; contaminant mobility, however, is minimized by containment in the landfill. There are no treatment residuals.

6.10.2.5 Short-Term Effectiveness

Section 6.3.2.5 describes the short-term effectiveness of this alternative. RAOs are achieved in 1 to 5 years.

6.10.2.6 Implementability

This alternative is technically and administratively feasible, with materials and services readily available.

6.10.2.7 Cost

The cost of Alternative 19 includes transportation to the landfill as well as long-term monitoring and maintenance of the landfill. There are 365 structures that can be addressed under this alternative. The present worth cost for this alternative is $72,700,000.

6.11 ALTERNATIVE 20: DISMANTLING, SALVAGE, OFF-POST HAZARDOUS WASTE LANDFILL

6.11.1 Description of Alternative

Alternative 20 includes dismantling the structure, salvaging decontaminated scrap metal, transporting the debris to an off-post hazardous waste landfill, and backfilling the structure excavation. This alternative is similar to Alternative 19 (Section 6.10), except that the disposal occurs off post.

6.11.2 Analysis of Alternative

6.11.2.1 Overall Protection of Human Health and the Environment

The disposal of the structural debris in an off-post hazardous waste landfill is protective of human health and the environment. Off-post disposal does not allow direct control of long-term monitoring and maintenance, which, compared to on-post disposal, lessens overall protectiveness.

6.11.2.2 Compliance with ARARs

Alternative 20 complies with action- and location-specific ARARs. ARARs regarding hazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-8.

6.11.2.3 Long-Term Effectiveness and Permanence

Disposing debris in an off-post hazardous waste landfill results in low residual risk, although the long-term effectiveness and permanence of this alternative may be questionable since there is lack of control over long-term monitoring and maintenance of the landfill. Since the disposal of debris occurs off post, wildlife habitat is improved at the site.

6.11.2.4 Reduction of TMV

Since there is no treatment of the structural debris, this alternative is ineffective in reducing toxicity or volume; contaminant mobility, however, is minimized by containment. There are no treatment residuals.

6.11.2.5 Short-Term Effectiveness

Off-post transportation of the debris increases the potential for environmental impacts to the community. RAOs are achieved in 1 to 3 years.

6.11.2.6 Implementability

This alternative is technically and administratively feasible, with materials and services readily available, although administrative feasibility is reduced because of concerns regarding the long-term liability of the waste landfilled off post.

6.11.2.7 Cost

The cost of Alternative 20 includes transportation to the off-post landfill as well as long-term monitoring and maintenance. There are 365 structures that can be addressed under this alternative. The present worth cost for this alternative is $80,100,000.

6.12 ALTERNATIVE 21: DISMANTLING, SALVAGE, CLAY CAP

6.12.1 Description of Alternative

Alternative 21 includes dismantling the structure, salvaging decontaminated scrap metal, and capping the debris in place. Capping is discussed in the Technology Description Volume, Section 6.

The sizing requirements for the cap are similar to those for a landfill. Once the debris is placed into the capping area, fill is used to raise the level of the debris pile so that surface water runoff is directed as desired. The cap covers an area 30 percent larger than the extent of the debris pile. Since many of the structures are located in proximity to each other, it is not practical to place individual caps over each structure, nor is it practical to cap single outlying structures. Therefore, outlying structures are consolidated into areas of high structure density and groups of structures are contained by a single cap where applicable. For Alternative 21 it was assumed that there are three capped areas: South Plants, North Plants, and the Railyard.

All of the structures in and around South Plants are placed in the central process area cap in conjunction with the overall containment alternative for the soils South Plants Medium Group. All structures in and around North Plants region are consolidated into a single capped area within North Plants. All structures in and around the Railyard region are placed in a single capped area within the Railyard. This approach minimizes the amount of capped area that is necessary to monitor and maintain and is consistent with the alternatives chosen for the soils medium. The North Plants and Railyard caps will be revegitated as part of the structures remediation.

6.12.2 Analysis of Alternative

6.12.2.1 Overall Protection of Human Health and the Environment

Alternative 21 is protective of human health and the environment through the isolation and containment of debris by capping.

6.12.2.2 Compliance with ARARs

Alternative 21 complies with action- and location-specific ARARs. ARARs regarding caps/covers are presented in the Technology Description Volume, Appendix A, Table A-5.

6.12.2.3 Long-Term Effectiveness and Permanence

Alternative 21 results in low residual risk, with structure debris contained by capping. Adequate controls are ensured by long-term monitoring and maintenance of the cap. Wildlife habitat is

both improved and limited under this alternative: it is improved because structures are removed and is limited because caps are emplaced and burrowing animals are excluded.

6.12.2.4 Reduction of TMV

This alternative is effective in reducing contaminant mobility through containment, but is ineffective in reducing toxicity and volume. However, contaminant mobility may change should the cap leak. Contaminated structures are isolated by the cap. There are no treatment residuals associated with this alternative. This alternative does require long-term maintenance and monitoring, thereby increasing overall costs.

6.12.2.5 Short-Term Effectiveness

Section 6.3.2.5 describes the short-term effectiveness of the alternative.

6.12.2.6 Implementability

The alternative is technically and administratively feasible. Materials and services are readily available.

6.12.2.7 Cost

There are 365 structures that can be addressed under this alternative. The present worth cost for this alternative is $35,500,000.

6.13 ALTERNATIVE 21a: DISMANTLING, SALVAGE, CONSOLIDATION

6.13.1 Description of Alternative

Alternative 21a includes dismantling the structure, salvaging decontaminated scrap metal, transporting and consolidating the debris in Basin A and backfilling the structure excavation. Consolidation refers to using the structural debris as fill in an area such as Basin A where alternatives developed for the soils medium are used to fill and cap the area. This can be an effective use of the structural debris since the amount of fill necessary in any of the soils capping

areas far exceeds the volume of structural material. Consolidation is discussed in the Technology Description Volume, Section 6.

6.13.2 Analysis of Alternative

6.13.2.1 Overall Protection of Human Health and the Environment

Consolidation of the structures is protective of human health and the environment.

6.13.2.2 Compliance with ARARs

The alternative complies with action- and location-specific ARARs. ARARs regarding caps/covers and consolidation are presented in the Technology Description Volume, Appendix A, Table A-5.

6.13.2.3 Long-Term Effectiveness and Permanence

The alternative has low residual risk since the structural debris is consolidated and capped in Basin A. Adequate controls are ensured with long-term monitoring and maintenance.

6.13.2.4 Reduction of TMV

Containment of the debris by consolidation reduces contaminant mobility, but toxicity and volume remain unchanged. There are no treatment residuals.

6.13.2.5 Short-Term Effectiveness

Section 6.3.2.5 describes the short-term effectiveness of the alternative. RAOs are achieved in 1 to 3 years.

6.13.2.6 Implementability

This alternative is technically and administratively feasible, with materials and services readily available.

6.13.2.7 Cost

The cost of this alternative includes transportation to Basin A as well as long-term monitoring and maintenance of the area. There are 365 structures amenable to this alternative. The present worth cost for this alternative is $30,900,000.

Table 6.0-1 Comparative Analysis of Alternatives, No Future Use, Manufacturing History Medium Group – Process History Subgroup

Criteria	ALT. 1: No Action	ALT. 2: Pipe Plugs, Locks/Boards/Fences/Signs
1. Overall protection of human health and environment	Does not provide any increase in protectiveness.	Limited protectiveness, eliminates contact with contaminants by preventing access to structure.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidances	Action-specific ARARs do not apply since no action is taken. Complies with location-specific ARARs.	Complies with action- and location-specific ARARs.
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls –Habitat impacts	Does not provide any increase in long-term effectiveness or permanence. Residual risk increases with time as structures deteriorate. Current access controls are inadequate for the long term. Habitat remains unchanged.	Moderate residual risk, contaminants are sealed inside pipes, and access to structure is prevented. Adequate controls, long-term monitoring and maintenance required. Habitat not improved.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	Does not reduce TMV.	Pipe plugging reduces mobility, but may be reversible if pipe plugs fail. Volume of waste is increased. Restricting access reduces mobility. There are no treatment residuals for this alternative.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	No worker or community protection is necessary because no action is taken. Does not achieve RAOs.	Worker protection necessary during pipe plugging and access restriction operations. No additional impacts to habitat. RAOs are attained within 1 year.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Not administratively feasible because further structure deterioration may pose a physical and chemical hazard.	Technically and administratively feasible. Services and materials are readily available.
7. Cost[1] –Present worth cost	$0.00	$38,300,000

[1] Cost does not include ongoing activities described in Secion 2.2.3 and listed in Table 9.4-4.

ARARs Applicable or Relevant and Appropriate Requirements
CY Cubic Yards
RAO Remedial Action Objective
TMV Toxicity, Mobility, or Volume
BDAT Best Demonstrated Available Technology

Table 6.0-1 Comparative Analysis of Alternatives, No Future Use, Manufacturing History Medium Group – Process History Subgroup

Criteria	ALT. 8: Hot Gas, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill	ALT. 9: Vacuum Dusting, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill
1. Overall protection of human health and environment	Protective, treatment limited to organics on nonflammable surfaces. Debris contained by landfilling.	Protective, treatment only applicable to removing contaminated dust.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidances	Complies with action- and location-specific ARARs.	Complies with action- and location-specific ARARs.
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls –Habitat impacts	Low residual risk, for structures with surface organic contamination on nonflammable surfaces only. Adequate controls for structural debris that can be placed in a nonhazardous waste landfill. Long-term maintenance required. Habitat improved at site, but limited at landfill.	Low residual risk for structures with dust contamination only. Adequate controls for structural debris that can be placed in a nonhazardous waste landfill. Long-term maintenance required. Habitat improved at site, but limited at landfill.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	Hot gas irreversibly reduces TMV of organics on nonflammable surfaces. Off gases are produced and treated by carbon adsorption. Landfilling reduces mobility, but may be reversible if landfill leaks.	Vacuum dusting irreversibly reduces contaminant mobility of surfaces contaminated with dusts. Treatment residuals consist of contaminated dusts.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	Worker exposure controls necessary during hot gas treatment a concern, toxic off gases produced. Dust controls needed for demolition. Positive habitat impacts at site. RAOs are achieved within 1 to 3 years.	Worker exposure controls required during vacuuming. Dust controls needed for demolition. Habitat improved at site. RAOs are achieved within 1 to 3 years.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Limited to organics on nonflammable surfaces. May compromise structural integrity. Isolation of treatment area difficult. Administratively feasible. Hot gas services and expertise limited.	Treatment limited to dust contamination only. Administratively and technically feasible. Materials and services readily available.
7. Cost[1] –Present worth cost	$119,000,000	$49,700,000

[1] Cost does not include ongoing activities described in Secion 2.2.3 and listed in Table 9.4-4.

ARARs Applicable or Relevant and Appropriate Requirements
CY Cubic Yards
RAO Remedial Action Objective
TMV Toxicity, Mobility, or Volume
BDAT Best Demonstrated Available Technology

Criteria	ALT. 9a: Steam Cleaning, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill	ALT. 10: Sand Blasting, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill
1. Overall protection of human health and environment	Protective, treatment limited to contamination on nonporous surfaces.	Protective, treatment limited to surface contaminants.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidances	Complies with action- and location-specific ARARs.	Complies with action- and location-specific ARARs.
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls –Habitat impacts	Low residual risk for structures with contamination on nonporous surfaces only. Adequate controls for structural debris that can be placed in a nonhazardous landfill. Long-term maintenance required. Habitat improved at site, but limited at landfill.	Low residual risk for structures with surface contamination only. Adequate controls for structural debris that can be placed in a nonhazardous waste landfill. Sand blasting satisfies BDAT for contaminated structural material. Long-term maintenance is required. Habitat improved at site, but limited at landfill.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	Steam cleaning irreversibly reduces mobility and volume of contaminants on non-porous surfaces. Treatment residuals consist of contaminated washwater.	Sand blasting irreversibly reduces the mobility and volume of surface contamination. Treatment is not applicable to wood. The treatment residuals consist of contaminated grit.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	Worker exposure controls during steam cleaning. Dust controls needed for demolition. Habitat improved at site. RAOs are achieved within 1 to 3 years.	Worker exposure controls during sand blasting. Dust controls needed for demolition. Habitat is improved at the site. RAOs are attained within 1 to 3 years.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Treatment limited to contaminants on nonporous surfaces. Administratively feasible. Materials and services readily available.	Treatment limited to surface contaminants, not applicable to wood surfaces. Administratively feasible. Materials and services readily available.
7. Cost[1] –Present worth cost	$50,300,000	$51,900,000

[1] Cost does not include ongoing activities described in Secion 2.2.3 and listed in Table 9.4-4.

ARARs Applicable or Relevant and Appropriate Requirements
CY Cubic Yards
RAO Remedial Action Objective
TMV Toxicity, Mobility, or Volume
BDAT Best Demonstrated Available Technology

Table 6.0-1 Comparative Analysis of Alternatives, No Future Use, Manufacturing History Medium Group – Process History Subgroup

Criteria	ALT. 12: Dismantling, Salvage, Off-Post Rotary Kiln Incineration, Off-Post Hazardous Waste Landfill	ALT. 13: Dismantling, Salvage, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill
1. Overall protection of human health and environment	Protective, debris treated by incineration and contained by landfilling.	Protective, debris treated by incineration and contained by landfilling.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidances	Complies with action- and location-specific ARARs.	Complies with action- and location-specific ARARs.
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls –Habitat impacts	Low residual risk, structural debris treated by incineration and contained by landfilling. Adequate controls for landfilled structural debris. Habitat improved at site.	Low residual risk, incinerated debris nonhazardous. Adequate controls, long-term maintenance required. Habitat improved at site, but limited at landfill.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	Incineration irreversibly reduces TMV. Treatment produces off gases. Landfill reduces mobility, but may be reversible if landfill leaks.	Incineration irreversibly reduces TMV, renders debris nonhazardous. Off gases are produced.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	Dust controls needed during demolition. Habitat improved at site. RAOs are attained within 1 to 3 years.	Dust controls needed for demolition. Air controls needed for incineration. Habitat improved at site. RAOs are achieved in 1 to 5 years.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Technically feasible. Administratively feasible, but long-term liability issues a concern with off-post disposal. Materials and services readily available.	Technically and administratively feasible. Materials and services are readily available.
7. Cost[1] –Present worth cost	\$528,000,000	\$95,800,000

[1] Cost does not include ongoing activities described in Secion 2.2.3 and listed in Table 9.4-4.

ARARs Applicable or Relevant and Appropriate Requirements
CY Cubic Yards
RAO Remedial Action Objective
TMV Toxicity, Mobility, or Volume
BDAT Best Demonstrated Available Technology

Table 6.0-1 Comparative Analysis of Alternatives, No Future Use, Manufacturing History
Medium Group – Process History Subgroup

Criteria	ALT. 19: Dismantling, Salvage, On-Post Hazardous Waste Landfill	ALT. 20: Dismantling, Salvage, Off-Post Hazardous Waste Landfill
1. Overall protection of human health and environment	Protective, debris is contained by landfilling.	Protective, debris contained by landfilling.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidances	Complies with action- and location-specific ARARs.	Complies with action- and location-specific ARARs.
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls –Habitat impacts	Low residual risk, structural debris is contained by landfilling. Adequate controls, long-term monitoring required. Habitat improved at site, but limited at landfill.	Low residual risk, structural debris contained by landfilling. Adequate controls for landfilled debris. Habitat improved at site.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	Landfilling reduces mobility. Mobility reduction may be reversed if landfill leaks. No treatment residuals.	Landfilling reduces mobility. Mobility reduction may be reversible if landfill leaks. No treatment residuals.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	Dust controls needed for demolition. Habitat improved at site. RAOs are achieved in 1 to 5 years.	Dust controls needed for demolition. RAOs achieved in 1 to 3 years.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Technically and administratively feasible. Materials and services readily available.	Technically and administratively feasible, but long-term liability a concern for off-post disposal. Materials and services readily available.
7. Cost[1] –Present worth cost	$72,700,000	$80.100,000

[1] Cost does not include ongoing activities described in Secion 2.2.3 and listed in Table 9.4-4.

ARARs Applicable or Relevant and Appropriate Requirements
CY Cubic Yards
RAO Remedial Action Objective
TMV Toxicity, Mobility, or Volume
BDAT Best Demonstrated Available Technology

Table 6.0-1 Comparative Analysis of Alternatives, No Future Use, Manufacturing History Medium Group – Process History Subgroup

Criteria	ALT. 21: Dismantling, Salvage, Clay Cap	ALT. 21a: Dismantling, Salvage, Consolidation
1. Overall protection of human health and environment	Protective, debris contained by capping.	Protective, debris contained through consolidation.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidances	Complies with action- and location-specific ARARs.	Complies with action- and location-specific ARARs.
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls –Habitat impacts	Low residual risk, structural debris contained by capping. Adequate controls, long-term maintenance and monitoring of caps required. Habitat improved, but restriction needed for burrowing animals.	Low residual risk, structural debris consolidated and capped in Basin A or other suitable area. Adequate controls, long-term maintenance and monitoring required. Habitat improved, but restrictions needed for burrowing animals.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	Capping reduces mobility, but may be reversible if cap leaks. No treatment residuals.	Consolidation reduces mobility. Mobility reduction may be reversible if cap leaks. No treatment residuals.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	Dust controls needed for demolition. Habitat improved at site. RAOs achieved in 1 to 3 years.	Dust controls needed for demolition. Habitat improved at site. RAOs achieved in 1 to 3 years.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Technically and administratively feasible. Materials and services readily available.	Technically and administratively feasible. Materials and services readily available.
7. Cost[1] –Present worth cost	$35,500,000	$30,900,000

[1] Cost does not include ongoing activities described in Secion 2.2.3 and listed in Table 9.4-4.

ARARs Applicable or Relevant and Appropriate Requirements
CY Cubic Yards
RAO Remedial Action Objective
TMV Toxicity, Mobility, or Volume
BDAT Best Demonstrated Available Technology

7.0 NO FUTURE USE, MANUFACTURING HISTORY–NON-PROCESS HISTORY SUBGROUP

Structures in the No Future Use, Manufacturing History–Non-Process History Subgroup include those structures that have administrative, utility, or support use histories, and are collocated with process history structures. No action, containment, and disposal options are considered among the general response actions applicable to this subgroup. Each alternative was described and analyzed according to the seven EPA evaluation criteria (see the Executive Summary). The alternatives applicable to this subgroup are a subset of the alternatives applicable to the Process History Subgroup, which are described in Section 6. These alternatives do not include any treatment options since the use histories of the structures indicate a low probability of contamination. Refer to Section 6.3 for the general alternative description and analysis, and to Table 7.0-1 for the comparative analysis in tabular format. Sampling for this subgroup is described in Section 2.4.

As with the Process History Subgroup, action-specific ARARs that apply to all alternatives in the Non-Process History Subgroup (with the exception of Alternative 1, No Action) include those regarding demolition of structures (Technology Description Volume, Appendix A, Table A-3), conventional excavation and backfill (Technology Description Volume, Appendix A, Table A-1), and transportation of wastes (Technology Description Volume, Appendix A, Table A-34). ARARs regarding demolition address worker protection, wildlife protection, noise control, and air emission control. The ARARs regarding stockpiling address waste characterization and management, wildlife protection, and worker protection. ARARs regarding excavation and backfill address worker protection, protection of wildlife, noise abatement, air emission control, waste characterization and management, and groundwater injection. ARARs regarding transportation of waste address transportation of hazardous wastes, both on and off post. All alternatives (with the exception of the No Action alternative) are in compliance with these action-specific ARARs, as well as location-specific ARARs, which are included in the Structures DSA, Technology Description Volume, Appendix A, Table 2A. Unique action-specific ARARs that apply to individual alternatives within the subgroup are described below.

7.1 ALTERNATIVE 1: NO ACTION

7.1.1 Description of Alternative

The No Action alternative involves no further action beyond existing measures. No action is applicable to the Non-Process History Subgroup because the use histories of the structures in this subgroup indicate a low probability of contamination. However, some structures in this subgroup may need to be removed to accomplish remediation of the underlying soils.

7.1.2 Analysis of Alternative

7.1.2.1 Overall Protection of Human Health and the Environment

This alternative is protective of human health and the environment to the extent that the structures in this subgroup do not contain any chemical contamination. However, physical hazards related to deterioration of the structures increase with time.

7.1.2.2 Compliance with ARARs

There are no action- or location-specific ARARs applicable to Alternative 1.

7.1.2.3 Long-Term Effectiveness and Permanence

Alternative 1 does not provide any long-term effectiveness or permanence.

7.1.2.4 Reduction of TMV

Alternative 1 does not reduce TMV.

7.1.2.5 Short-Term Effectiveness

Since there is no action taken, no worker or community protection is necessary, nor are there environmental impacts associated with this alternative.

7.1.2.6 Implementability

This alternative is technically implementable. It is not administratively feasible, however, because further deterioration of the structures may pose a physical hazard.

7.1.2.7 Cost

The cost of Alternative 1 is $0.00.

7.2 ALTERNATIVE 2a: LOCKS/BOARDS/FENCES/SIGNS

7.2.1 Description of Alternative

Structures Alternative 2a is very similar to Alternative 2 (Section 6.2) except that it does not include pipe plugging, which is not applicable to this subgroup. Alternative 2a uses a combination of locks, boards, fences, and signs to prevent access to the structure. Locks, boards, fences, and signs are described in the Technology Description Document, Section 3.

Before Alternative 2a can be implemented, each structure in the subgroup must be visually examined. An interior and exterior examination is performed to determine the structural integrity of the building. If any of the structures are found to be unsafe for the implementation of Alternative 2a, the structures are repaired to ensure the safety of workers in and around the structures. The necessary repairs for many of the structures in this subgroup may represent a significant effort. It was assumed that there is no ACM associated with these structures at the time of remediation since the scope of the Asbestos IRA, currently in progress, is to remove all ACM from structures.

Locks, boards, fences, and signs are installed as appropriate to prevent access to the structure. Due to the unique configuration and differing accessibility of structures in this subgroup, the types and quantities of locks, boards, fences, or signs are evaluated separately for each structure.

Since Alternative 2a is a containment option, the structures remain intact indefinitely; therefore, inspections and repairs are performed on a regular basis as part of this alternative.

7.2.2 Analysis of Alternative

7.2.2.1 Overall Protection of Human Health and the Environment

This alternative is protective of human health and the environment by preventing access to a structure. Since this subgroup is not expected to be contaminated, access prevention is sufficient for protection.

7.2.2.2 Compliance with ARARs

This alternative complies with applicable action- and location-specific ARARs. Applicable action-specific ARARs related to this alternative include institutional controls (Technology Description Document, Appendix A, Table A-35). ARARs regarding institutional controls address access restrictions, land use/deed restrictions, and monitoring. The location-specific ARARs applicable to this alternative are included in the Structures DSA, Technology Description Volume, Appendix A, Table 2A.

7.2.2.3 Long-Term Effectiveness and Permanence

There is low residual risk associated with this alternative since the structures in this subgroup have no history of contamination, although there is a need for preventive maintenance and long-term monitoring for an indefinite period of time. The long-term effectiveness and permanence of this alternative is therefore questionable. This alternative protects wildlife by preventing contact with potential contamination, but the habitat remains unchanged and may actually be reduced for species that used the structures as part of their habitat. However, some burrowing or invasive species (e.g., rodents, insects) may eventually regain access to the structure and re-establish their habitat.

7.2.2.4 Reduction of TMV

The use of locks, boards, fences, and signs to prevent access is effective in reducing the mobility of contaminants; however, it does not reduce volume or toxicity. Because there is no contamination expected to be associated with these structures, however, TMV reduction is not necessary. The alternative produces no treatment residuals.

7.2.2.5 Short-Term Effectiveness

Worker protection is necessary during isolation operations. There are no environmental impacts to the community from this remedial action. RAOs are achieved within 1 year.

7.2.2.6 Implementability

This alternative is both administratively and technically implementable, with services and materials readily available. Services and materials for structural repair as well as for the locks, boards, fences, and signs are readily available.

7.2.2.7 Cost

The cost of Alternative 2a includes annual ambient air monitoring of the structure and is based on the assumption that the structure makes use of a dedicated high-volume air sampler. Alternative 2a is applicable to 423 structures in the Non-Process History Subgroup. The present worth cost of Alternative 2a is approximately $8,630,000. These costs include monitoring and long-term maintenance for a 30-year period, after which time the need for maintenance and monitoring is re-evaluated. It is anticipated that maintenance and monitoring continue past the 30-year period at an approximate annual cost of $338,000.

7.3 ALTERNATIVE 19a: DISMANTLING, SALVAGE, ON-POST NONHAZARDOUS WASTE LANDFILL

7.3.1 Description of Alternative

Alternative 19a includes dismantling the structure, salvaging the metal from the debris, transporting the debris to an on-post nonhazardous waste landfill, and backfilling the structure excavation.

7.3.2 Analysis of Alternative

7.3.2.1 Overall Protection of Human Health and the Environment

Containing structural debris by placing it in an on-post nonhazardous waste landfill is protective of human health and the environment since the debris from structures in this subgroup is expected to be nonhazardous.

7.3.2.2 Compliance with ARARs

Alternative 19a complies with action- and location-specific ARARs. ARARs regarding nonhazardous waste landfills are described in the Technology Description Document, Appendix A, Table A-8.

7.3.2.3 Long-Term Effectiveness and Permanence

The disposal of structural debris in an on-post nonhazardous waste landfill results in low residual risk since no contamination is expected to be associated with these structures. There are no treatment residuals associated with this alternative. Adequate controls require long-term monitoring and maintenance of the landfill. Wildlife habitat is limited at the landfill.

7.3.2.4 Reduction of TMV

Since no contaminants are expected to be associated with this subgroup, reduction in TMV is not applicable. There are no treatment residuals.

7.3.2.5 Short-Term Effectiveness

Section 6.3.2.5 describes the short-term effectiveness of this alternative. RAOs are achieved in 1 to 5 years.

7.3.2.6 Implementability

Alternative 19a is technically and administratively feasible, with materials and services readily available. Salvage options for the Non-Process History Subgroup are unlimited because no contamination is expected to be associated with the structures.

7.3.2.7 Cost

The cost of Alternative 19a includes transportation to the landfill as well as long-term monitoring and maintenance of the landfill. The 423 structures in this subgroup can be addressed by this alternative. The present worth cost for this alternative is $13,900,000.

7.4 ALTERNATIVE 20a: DISMANTLING, SALVAGE, OFF-POST NONHAZARDOUS WASTE LANDFILL

7.4.1 Description of Alternative

Alternative 20a includes dismantling the structure, salvaging the metal from the debris, transporting the debris to an off-post nonhazardous waste landfill, and backfilling the structure excavation. This alternative is very similar to Alternative 19a, except that the disposal is off post.

7.4.2 Analysis of Alternative

7.4.2.1 Overall Protection of Human Health and the Environment

Containing structural debris by placing it in an off-post nonhazardous waste landfill is protective of human health and the environment since the debris in this subgroup is expected to be nonhazardous.

7.4.2.2 Compliance with ARARs

Alternative 20a complies with action- and location-specific ARARs. ARARs regarding nonhazardous waste landfills are described in the Technology Description Document, Appendix A, Table A-8.

7.4.2.3 Long-Term Effectiveness and Permanence

The disposal of structural debris in an off-post nonhazardous waste landfill results in low residual risk since no contamination is expected to be associated with these structures. There are no treatment residuals associated with this alternative. Adequate controls require long-term

monitoring and maintenance of the landfill. Since disposal of the debris is off post, wildlife habitat is improved throughout the site.

7.4.2.4 Reduction of TMV

Since no contaminants are expected to be associated with this subgroup, reduction in TMV is not applicable. There are no treatment residuals.

7.4.2.5 Short-Term Effectiveness

Off-post transportation of the structural debris increases the potential for environmental impacts to the community associated with this alternative. RAOs are achieved in 1 to 3 years.

7.4.2.6 Implementability

Alternative 20a is technically and administratively feasible, with materials and services readily available. Salvage options for the Non-Process History Subgroup are unlimited because no contamination is expected to be associated with the structures.

7.4.2.7 Cost

The cost of Alternative 20a includes transportation to the landfill. The 423 structures in this subgroup can be addressed by this alternative. The present worth cost for this alternative is $13,100,000.

7.5 ALTERNATIVE 21: DISMANTLING, SALVAGE, CLAY CAP

7.5.1 Description of Alternative

Alternative 21 includes dismantling the structure, salvaging the metal from the debris, and capping the debris in a local collection point. Capping is described in the Technology Description Document, Section 6, and a detailed description of this alternative is provided in Section 6.12.

7.5.2 Analysis of Alternative

7.5.2.1 Overall Protection of Human Health and the Environment

Alternative 21 is protective of human health and the environment through the isolation and containment of debris by capping.

7.5.2.2 Compliance with ARARs

The alternative complies with action- and location-specific ARARs. ARARs regarding caps/covers are described in the Technology Description Document, Appendix A, Table A-5.

7.5.2.3 Long-Term Effectiveness and Permanence

Alternative 21 results in low residual risk, with structural debris contained by capping. This alternative requires long-term maintenance and monitoring of the clay caps to ensure adequate controls are maintained. Wildlife habitat is limited in the vicinity of each of the caps.

7.5.2.4 Reduction of TMV

Since no contaminants are expected to be associated with this subgroup, reduction in TMV is not applicable. However, should there be any contamination in the structural debris, its mobility is removed by containment. There are no treatment residuals.

7.5.2.5 Short-Term Effectiveness

Section 6.3.2.5 describes the short-term effectiveness of this alternative. RAOs are achieved in 1 to 5 years.

7.5.2.6 Implementability

The alternative is technically and administratively feasible. Materials and services are readily available.

7.5.2.7 Cost

There are 423 structures in this subgroup that are amenable to this alternative. The present worth cost for this alternative is $13,600,000.

7.6 ALTERNATIVE 21a: DISMANTLING, SALVAGE, CONSOLIDATION

7.6.1 <u>Description of Alternative</u>

Alternative 21a includes dismantling the structure, salvaging the metal materials from the debris, transporting and consolidating the debris in Basin A, and backfilling the structure excavation. Consolidation is described in the Technology Description Document, Section 6. The detailed description of this alternative is provided in Section 6.13.

7.6.2 <u>Analysis of Alternative</u>

7.6.2.1 Overall Protection of Human Health and the Environment

Consolidation of the structural debris is protective of human health and the environment since the debris is contained and is expected to be nonhazardous.

7.6.2.2 Compliance with ARARs

Alternative 21a complies with action- and location-specific ARARs. ARARs regarding caps/covers and consolidation are described in the Technology Description Document, Appendix A, Table A-5.

7.6.2.3 Long-Term Effectiveness and Permanence

On-site consolidation of the nonhazardous debris in Basin A results in low residual risk. Adequate controls require long-term monitoring and maintenance of the consolidation area.

7.6.2.4 Reduction of TMV

Since no contaminants are expected to be associated with this subgroup, reduction in TMV is not applicable. However, should there be any contamination in the structural debris, its mobility is eliminated by containment. There are no treatment residuals.

7.6.2.5 Short-Term Effectiveness

Section 6.3.2.5 describes the short-term effectiveness of this alternative. RAOs are achieved in 1 to 5 years.

7.6.2.6 Implementability

This alternative is technically and administratively feasible, with materials and services readily available. Metal salvage options for the Non-Process History Subgroup are unlimited because no contamination is expected to be associated with the structures.

7.6.2.7 Cost

The cost of this alternative includes transportation to Basin A as well as long-term monitoring and maintenance of the area. There are 423 structures in this subgroup that are amenable to this alternative. The present worth cost for this alternative is $10,600,000.

Table 7.0-1 Comparative Analysis of Alternatives, No Future Use, Manufacturing History
Medium Group – Non-Process History Subgroup

Criteria	ALT. 1: No Action	ALT. 2a: Locks/Boards/Fences/Signs
1. Overall protection of human health and environment	Not protective of physical hazards.	Protective, eliminates contact by preventing access to structure.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidances	There are no action- or location-specific ARARs for this medium subgroup.	Complies with action- and location-specific ARARs.
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls –Habitat impacts	Does not provide long-term effectiveness or permanence.	Low residual risk, access to structure prevented. Adequate controls, long-term structure maintenance and monitoring required. Habitat not improved.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	Does not reduce TMV.	Access restrictions reduce mobility. No treatment residuals.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	No worker or community protection is necessary, no environmental impacts.	Standard worker protection for isolation operations. Habitat unchanged. RAOs are achieved in 1 year.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Technically feasible. Not administratively feasible because further deterioration of structures may pose a physical hazard.	Technically and administratively feasible. Materials and services readily available.
7. Cost[1] –Present worth cost	$0.00	$8,630,000

[1] Cost does not include ongoing activities described in Section 2.2.3 and listed in Table 9.4-4

ARARs Applicable or Relevant and Appropriate Requirements
TMV Toxicity, Mobility, or Volume
CY Cubic Yards
RAO Remedial Action Objective

Table 7.0-1 Comparative Analysis of Alternatives, No Future Use, Manufacturing History Medium Group – Non-Process History Subgroup

Criteria	ALT. 19a: Dismantling, Salvage, On-Post Nonhazardous Waste Landfill	ALT. 20a: Dismantling, Salvage, Off-Post Nonhazardous Waste Landfill
1. Overall protection of human health and environment	Protective, debris contained by landfilling.	Protective, debris contained by landfilling.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidances	Complies with action- and location-specific ARARs.	Complies with action- and location-specific ARARs.
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls	Low residual risk, structural debris contained by landfilling. Adequate controls, long-term monitoring required.	Low residual risk, structural debris contained by landfilling.
–Habitat impacts	Habitat improved at site, but limited at landfill.	Habitat improved at site.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction	Since no contaminants are expected to be associated with this subgroup, reduction in TMV is not applicable	Since no contaminants are expected to be associated with this subgroup, reduction in TMV is not applicable
–Irreversibility of TMV reduction –Type and quantity of treatment residuals	No treatment residuals.	No treatment residuals.
5. Short-term effectiveness –Protection of workers during remedial action	Dust controls needed for demolition.	Dust controls needed for demolition.
–Protection of community during remedial action	Habitat improved at site.	Habitat improved at site.
–Environmental impacts of remedial actions –Time until RAOs are achieved	RAOs are achieved in 1 to 5 years.	RAOs are achieved in 1 to 3 years.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Technically and administratively feasible; disposal in a hazardous waste landfill not required by ARARs.	Technically and administratively feasible. Long-term liability a concern for off-post disposal. Hazardous waste disposal not required by ARARs.
	Materials and services readily available.	Materials and services readily available.
7. Cost[1] –Present worth cost	$13,900,000	$13,100,000

[1] Cost does not include ongoing activities described in Section 2.2.3 and listed in Table 9.4-4

ARARs Applicable or Relevant and Appropriate Requirements
TMV Toxicity, Mobility, or Volume
CY Cubic Yards
RAO Remedial Action Objective

Table 7.0-1: Comparative Analysis of Alternatives, No Future Use, Manufacturing History Medium Group – Non-Process History Subgroup

Criteria	ALT. 21: Dismantling, Salvage, Clay Cap	ALT. 21a: Dismantling, Salvage, Consolidation
1. Overall protection of human health and environment	Protective, achieves RAOs by containment.	Protective, achieves RAOs through consolidation and containment.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidances	Complies with action- and location-specific ARARs.	Complies with action- and location-specific ARARs.
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls –Habitat impacts	Low residual risk, structural debris contained by capping. Adequate controls, long-term maintenance and monitoring of caps required. Habitat improved, but need restrictions for burrowing animals.	Low residual risk, structural debris consolidated and capped in Basin A or other suitable area. Adequate controls, long-term maintenance and monitoring of capped area required. Habitat improved, but restrictions for burrowing animals.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	Since no contaminants are expected to be associated with this subgroup, reduction in TMV is not applicable No treatment residuals.	Since no contaminants are expected to be associated with this subgroup, reduction n TMV is not applicable No treatment residuals.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	Dust controls needed for demolition. Habitat improved at site. RAOs are achieved in 1 to 5 years.	Dust controls needed during demolition. Habitat improved at site, limited at capped area. RAOs are achieved in 1 to 5 years.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Technically and administratively feasible. Materials and services readily available.	Technically and administratively feasible. Materials and services readily available.
7. Cost[1] –Present worth cost	$13,600,000	$10,600,000

[1] Cost does not include ongoing activities described in Section 2.2.3 and listed in Table 9.4-4

ARARs Applicable or Relevant and Appropriate Requirements
TMV Toxicity, Mobility, or Volume
CY Cubic Yards
RAO Remedial Action Objective

8.0 NO FUTURE USE, AGENT HISTORY MEDIUM GROUP

Structures in the No Future Use, Agent History Medium Group include those with a history of producing, processing, testing, storing, or destroying Army chemical agents. Plate 3.0-1 shows the locations of these structures. These structures must be handled in compliance with AR 385-131, and Department of Defense (DOD) regulations in effect at the time of remediation. Action must be taken to treat the agent contamination within the structure or debris to a level consistent with Army regulations (3X or 5X) so it may be properly disposed. Many of the structures in this medium group are covered under chemical weapons treaties as described in Section 3.3.4.

The remedial alternatives developed for this group encompass the range of treatment and disposal options necessary to deal with the wide range of contaminants potentially associated with these structures (Table 8.0-1). Containment or institutional control options, without treatment, are not suitable response actions for the structures in this medium group. Likewise, the technology types of surface cleaning and surface removal are not suitable for this medium group unless the agent-contaminated structural material is chemically treated to 3X standard so the materials can be placed in a hazardous waste landfill. Alternatively, materials thermally treated to the 5X standard can be released from government control. Salvage is not a suitable process option for agent-contaminated structural materials due to potential regulatory and community concerns. The alternatives were analyzed according to the seven EPA evaluation criteria (see the Executive Summary).

All of the alternatives considered for the No Future Use, Agent History Medium Group have demolition and landfilling in common with those developed for the No Future Use, Manufacturing History Medium Group. Refer to Section 6.3 for a general discussion and analysis of these options. Because structures in this medium group are regulated under AR 385–131, there are certain aspects of the remedial alternatives (e.g., air monitoring, worker protection) that are unique to this medium group. In addition, as discussed in Section 6, it was assumed that all ACM is removed from the structures prior to the initiation of the structures remediation under the Asbestos IRA. ACM in this medium group is regulated under AR 385-

131, however, the removal of most of the ACM is expected to be conducted as an integral part of structures remediation. As described in Section 2.2.3, the cost of ACM removal is covered by the Asbestos IRA. It is assumed that all process equipment, piping, and tanks are removed and treated to 3x standard prior to the structures remediation under the chemical-process-related activities.

Before any of the alternatives can be implemented, and before any structural repair is completed, air monitoring of the interior of the structure must be performed to determine whether agent is present. If agent is detected, suitable treatments and worker protection are implemented in accordance with AR 385-131 and visual inspection and demolition is conducted (Section 6.3). After the debris is sized for placement in a hazardous waste landfill, it is confined and the interior air space monitored for the presence of agent. Should agent be detected at or above action levels, additional treatment will be necessary. Debris that passes monitoring standards are elevated to 3X status and transported to the landfill for disposal.

As with the No Future Use, Manufacturing History Medium Group, action-specific ARARs that apply to all alternatives in the No Future Use, Agent History Medium Group (with the exception of Alternative 1, No Action) include those ARARs related to demolition of structures (Technology Description Volume, Appendix A, Table A-3). ARARs regarding demolition address worker protection, wildlife protection, noise control, and air emission control. ARARs regarding stockpiling address waste characterization and management, wildlife protection, and worker protection. All alternatives, with the exception of the No Action alternative, are in compliance with these action-specific ARARs as well as location-specific ARARs, which are listed in the Structures DSA, Volume I, Appendix A, Table 2A. Unique action-specific ARARs that apply to individual alternatives within the medium group are described below.

8.1 ALTERNATIVE 1: NO ACTION

8.1.1 Description of Alternative

The No Action alternative is generally not a suitable alternative for this medium group.

8.1.2 Analysis of Alternative

8.1.2.1 Overall Protection of Human Health and the Environment

Alternative 1 does not provide protection of human health and the environment if agent contamination is present. Structures continue to deteriorate under this alternative.

8.1.2.2 Compliance with ARARs

Alternative 1 does not comply with location-specific ARARs. There are no action-specific ARARs for this alternative.

8.1.2.3 Long-Term Effectiveness and Permanence

Alternative 1 does not provide long-term effectiveness or permanence.

8.1.2.4 Reduction of TMV

Alternative 1 does not reduce contaminant TMV.

8.1.2.5 Short-Term Effectiveness

Since there is no action taken there are no environmental impacts to the community. RAOs are not achieved.

8.1.2.6 Implementability

This alternative is technically and administratively feasible.

8.1.2.7 Cost

The present worth cost of this alternative is $0.00.

8.2 ALTERNATIVE 4: HOT GAS, DISMANTLING, ON-POST HAZARDOUS WASTE LANDFILL

8.2.1 <u>Description of Alternative</u>

This alternative includes administering in situ hot gas treatment, dismantling the structure, consolidating the resulting debris in the on-post hazardous waste landfill, and backfilling the structure excavation.

In situ hot gas treatment for structures is limited to nonflammable surfaces (e.g., metals, masonry) where agent production or handling operations occurred, where documented spills occurred, or where air monitoring has detected agent. Hot gas treatment consists of injecting hot gases into a sealed room to thermally desorb contaminants from structural surfaces. The treatment produces a gaseous sidestream in which the entrained contaminants are captured and treated by incineration. Pre-treatment of the structure includes isolating the treatment area and post-treatment includes collecting and treating the off gases produced. Due to the limited applicability of hot gas treatment, some potentially contaminated portions of the structure may not be able amenable to this treatment. Following hot gas treatment, the structure is again monitored for agent prior to dismantling. If agent is still detected, the structure is once again treated before dismantling takes place. Hot gas treatment is described in the Technology Description Volume, Section 8.

8.2.2 <u>Analysis of Alternative</u>

8.2.2.1 Overall Protection of Human Health and the Environment

Alternative 4 is protective of human health and the environment, although treatment is limited to organics on nonflammable surfaces. Pilot-scale tests have proven that hot gas is an effective treatment for structures contaminated with Army chemical agent.

8.2.2.2 Compliance with ARARs

The alternative complies with action- and location-specific ARARs. ARARs regarding hot gas decontamination of structures and debris are presented in the Technology Description Volume,

Appendix A, Table A-15, and ARARs regarding hazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-8.

8.2.2.3 Long-Term Effectiveness and Permanence

Alternative 4 has a low residual risk for structures with surficial organic and Army chemical agent contamination on nonflammable surfaces. Hot gas treatment removes Army chemical agent from the surfaces of structures, thereby decreasing the residual risk and enhancing the effectiveness and permanence of the alternative.

8.2.2.4 Reduction of TMV

Hot gas treatment of nonflammable surfaces irreversibly reduces the TMV of organics and Army chemical agent. Treatment residuals include potentially hazardous off gases that must be collected and treated as part of the process.

8.2.2.5 Short-Term Effectiveness

Worker protection controls are instituted during hot gas treatment. Due to the aggressive nature of this treatment and the possibility of liberating Army chemical agent, all off gases must be collected and treated to protect the health and safety of the community. This alternative assumes that all Army chemical agent is effectively treated to the 3X standard. The debris is monitored for Army chemical agent after demolition. If agent is detected, additional treatment will be necessary, which may limit the effectiveness of this alternative. RAOs are achieved within 1 to 5 years.

8.2.2.6 Implementability

There are limits to the technical feasibility of this alternative because isolation of the treatment area is difficult and because hot gas treatment may compromise structural integrity. The ability to seal the structure may limit the effectiveness of hot gas treatment due to heat loss or gas leakage through gaps in the structure. Structural repair to eliminate leakage pathways may be required prior to treatment. In addition, the complexity of the physical configuration of the

structure (i.e., the inaccessibility of corners or recesses) may prevent even heating, and the physical properties of the structure may inhibit the diffusion and release of contaminants to the gas stream (e.g., smooth steel may release contaminants more readily than porous concrete). The alternative is administratively feasible. To date, hot-gas technology has only been developed at the pilot scale, and its effectiveness at full field scale is unknown. It is not a commercially available technology, and technical expertise is limited.

8.2.2.7 Cost

For cost-estimating purposes, it was assumed that dismantling is used to demolish the structure and that only interior surfaces are treated. There are 67 structures amenable to this alternative. The cost of this alternative also includes air monitoring for analytical verification of the effectiveness of the treatment and incineration treatment of the emitted gas. The present worth cost of this alternative is approximately $181,000,000, including transportation to an on-post hazardous waste landfill.

8.3 ALTERNATIVE 6: HOT GAS, DISMANTLING, ON-POST ROTARY KILN INCINERATION, ON-POST NONHAZARDOUS WASTE LANDFILL

8.3.1 Description of Alternative

Alternative 6 includes administering in situ hot gas treatment, dismantling the structure, and incinerating the debris in an on-post rotary kiln incinerator, transporting and disposing of the ash in the on-post nonhazardous waste landfill and backfilling the structure excavation. This alternative is similar to Alternative 4 except for the addition of rotary kiln incineration to treat the debris.

8.3.2 Analysis of Alternative

8.3.2.1 Overall Protection of Human Health and the Environment

Alternative 6 is protective of human health and the environment through destruction of organic contaminants, including Army chemical agent, through hot gas treatment and incineration.

Incinerating agent-contaminated wastes allows the waste to be classified as nonhazardous (i.e., 5X).

8.3.2.2 Compliance with ARARs

The alternative complies with action- and location-specific ARARs. ARARs regarding hot gas decontamination of structures and debris are presented in the Technology Description Volume, Appendix A, Table A-15; ARARs regarding on-post rotary kiln incineration are presented in the Technology Description Volume, Appendix A, Table A-11; and ARARs regarding nonhazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-9.

8.3.2.3 Long-Term Effectiveness and Permanence

Since incinerated debris is assumed to be nonhazardous (i.e., 5X), there is low residual risk with this alternative. Adequacy and reliability of controls are enhanced by the destruction of contaminants through incineration. Wildlife habitat is limited at the landfill.

8.3.2.4 Reduction of TMV

This alternative irreversibly reduces contaminant TMV through the complete thermal destruction of organic contaminants, including Army chemical agent. Hot gas irreversibly reduces the TMV of organics on nonflammable surfaces and produces off gases that require treatment. Rotary kiln incineration is assumed to achieve complete decontamination (i.e., 5X status) through treatment at temperatures exceeding 1,000 degrees Fahrenheit (°F). Off gases produced during the incineration process must be treated. The rotary kiln is the most commonly used type of hazardous waste incinerator, and can effectively process demolition debris. Supplemental fuels are required due to the low heating value of the material. High-ash-content wastes such as bricks and concrete may remain hazardous after incineration if leachable metals are present in the ash.

8.3.2.5 Short-Term Effectiveness

Worker protection is a concern for hot gas treatment because potentially toxic off gases might be produced (Section 8.2.2.5). To protect the community, air controls are required during the conduct of both hot gas treatment and incineration. RAOs are achieved in 1 to 5 years.

8.3.2.6 Implementability

This alternative is administratively and technically feasible. However, it is limited to nonflammable surfaces and it is difficult to implement due to the need for materials processing, extensive fuel requirements and, for structures contaminated with inorganics, potential ash disposal concerns. Furthermore, there are concerns regarding the limited reduction in total material volume and community acceptance of the incinerator, and the treatment may compromise the integrity of the structure and isolating the treatment area is difficult. Professional expertise and services for the rotary kiln are readily available, although those for hot gas treatment are not.

8.3.2.7 Cost

The cost of this alternative includes representative air monitoring for analytical verification of the effectiveness of the treatment and for incineration treatment of the emitted gas. It was assumed that only interior surfaces are treated with hot gas and that the entire structure volume is shreddable and is to be incinerated. The present worth cost of this alternative is approximately $216,000,000, which includes transportation of the debris for use as on-post fill or for placement in the on-post nonhazardous waste landfill.

8.4 ALTERNATIVE 14: DISMANTLING, ON-POST HAZARDOUS WASTE LANDFILL

8.4.1 Description of Alternative

Alternative 14 includes dismantling the structure, placing the debris and waste in an on-post hazardous waste landfill, and backfilling the structure excavation. Alternative 14 has limited applicability to the No Future Use, Agent History Medium Group. Dismantling and disposing of agent-contaminated structures without treatment is only possible if Army regulations concerning agent handling are satisfied, i.e., Army chemical agent is detected neither before nor after demolition of the structure.

8.4.2 Analysis of Alternative

8.4.2.1 Overall Protection of Human Health and the Environment

Alternative 14 offers limited protection of human health and the environment because it assumes that Army chemical agent is not detected during pre- and post-demolition monitoring. If agent is detected, treatment is necessary prior to landfilling, which limits the applicability of this alternative.

8.4.2.2 Compliance with ARARs

Alternative 14 complies with action- and location-specific ARARs, but may not satisfy Army regulations concerning the handling of agent if any material does not meet 3X status. ARARs regarding hazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-8.

8.4.2.3 Long-Term Effectiveness and Permanence

There is low residual risk associated with the alternative only if Army chemical agent is not detected. If Army chemical agent is detected in monitoring, Alternative 14 is not applicable.

8.4.2.4 Reduction of TMV

Since Alternative 14 does not include treatment of the structures, it is not effective in reducing toxicity or volume; however, contaminant mobility is minimized by containment. There are no treatment residuals.

8.4.2.5 Short-Term Effectiveness

Dust controls are necessary for community protection. There is a potential for impacts on workers and on the community since there is no treatment of Army chemical agent included in this alternative. RAOs are achieved in 1 to 5 years if no Army chemical agent is detected during monitoring.

8.4.2.6 Implementability

This alternative is not administratively feasible if debris does not meet Army decontamination criteria. Materials and services for demolition are readily available.

8.4.2.7 Cost

The cost of this alternative includes transportation to the landfill as well as long-term monitoring and maintenance of the landfill. There are 67 structures amenable to this alternative. The present worth cost for this alternative is $113,000,000.

8.5 ALTERNATIVE 15: DISMANTLING, ON-POST ROTARY KILN INCINERATION, ON-POST NONHAZARDOUS WASTE LANDFILL

8.5.1 Description of Alternative

Alternative 15 involves dismantling the structure, incinerating the resulting debris and waste in an on-post rotary kiln, disposing of the incinerator ash in an on-post nonhazardous waste landfill or in Basin A, and backfilling the structure excavation. This alternative is similar to Alternative 6 (Section 8.3) except that it does not include hot gas treatment.

8.5.2 Analysis of Alternative

8.5.2.1 Overall Protection of Human Health and the Environment

Alternative 15 is protective of human health and the environment because it destroys organic contaminants, including Army chemical agent through incineration.

8.5.2.2 Compliance with ARARs

Alternative 15 complies with action- and location-specific ARARs. ARARs regarding on-post rotary kiln incineration are presented in the Technology Description Volume, Appendix A, Table A-11, and ARARs regarding nonhazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-9.

8.5.2.3 Long-Term Effectiveness and Permanence

Alternative 15 results in low residual risk because incinerated debris is assumed to be nonhazardous. Residual risk for this alternative may be higher if inorganic contaminants are present in the structural materials. Because contaminants are destroyed during the incineration process, adequacy and reliability of controls are enhanced by incineration. Wildlife habitat is limited at the landfill.

8.5.2.4 Reduction of TMV

This alternative irreversibly reduces contaminant TMV through the complete thermal destruction of organic contaminants at temperatures exceeding 1,000°F. This treatment results in 5X decontamination of the debris. Off gases produced during the incineration process must be treated. The rotary kiln, the most commonly used type of hazardous waste incinerator, can effectively process demolition debris. This process is effective in treating organic contaminants, but ineffective in treating inorganic contaminants. As a result, high-ash-content wastes such as bricks and concrete may require solidification or other treatment after incineration if leachable metals are present in the ash.

8.5.2.5 Short-Term Effectiveness

To ensure the health and safety of the community, air monitoring and controls are required during incineration. RAOs are achieved in 1 to 5 years.

8.5.2.6 Implementability

This alternative is administratively and technically feasible, with materials and services readily available. However, it is difficult to implement due to the need for materials processing, extensive fuel requirements and, for structures contaminated with inorganics, ash disposal concerns. Furthermore, there are concerns regarding the limited reduction in total material volume and community acceptance of the incinerator.

8.5.2.7 Cost

It was assumed that the entire structure volume is shreddable and is incinerated. There are 67 structures amenable to this alternative. The present worth cost for this alternative is approximately $164,000,000.

8.6 ALTERNATIVE 17: DISMANTLING, HOT GAS, ON-POST HAZARDOUS WASTE LANDFILL

8.6.1 Description of Alternative

This alternative includes dismantling the structure, administering hot gas treatment to the debris and waste, disposing of the treated material in the on-post hazardous waste landfill established for contaminated RMA soils, and backfilling the structure excavation. This alternative is similar to Alternative 4 except that hot gas treatment is performed on the debris.

Dismantled materials are loaded into sealable 20-CY rolloffs in preparation for hot gas treatment. Debris in each rolloff is monitored for agent, and those rolloffs containing agent-contaminated debris are designated for treatment. It was assumed that 5 percent of the materials show detections of agent at actionable levels. Debris that tests negative (3X) for agent is directly disposed at the on-post hazardous waste landfill. Debris that tests positive for agent is transported in the rolloffs to an on-post facility for hot gas treatment. This facility may either be a structure designed and built specifically for the treatment or it may be an existing structure that meets the criteria for treatment. The debris is treated in the rolloff containers and the off gases collected and treated. Following hot gas treatment, the debris is monitored for agent. If agent is detected, the debris undergoes further hot gas treatment until agent is no longer detected. When the debris tests negative for agent, it is transported to the on-post hazardous waste landfill for disposal.

8.6.2 Analysis of Alternative

8.6.2.1 Overall Protection of Human Health and the Environment

Alternative 17 is protective of human health and the environment, although hot gas treatment is limited to nonflammable debris.

8.6.2.2 Compliance with ARARs

The alternative complies with action- and location-specific ARARs. ARARs regarding hot gas decontamination of structures and debris are presented in the Technology Description Volume, Appendix A, Table A-15, and ARARs regarding hazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-8.

8.6.2.3 Long-Term Effectiveness and Permanence

There is low residual risk associated with this alternative if the contaminants, including Army chemical agent, are associated with nonflammable debris. If contaminants are associated with flammable surfaces, hot gas treatment is not applicable since the controls are not adequate. Wildlife habitat is limited at the landfill.

8.6.2.4 Reduction of TMV

This alternative is effective in irreversibly reducing organic contaminant TMV through the hot gas treatment if the contaminants are associated with nonflammable surfaces. Treatment residuals include off gases that must be collected and treated.

8.6.2.5 Short-Term Effectiveness

Worker protection controls are instituted during hot gas treatment. To ensure the health and safety of the community, air monitoring and emission controls are needed during hot gas treatment. RAOs achieved within 1 to 5 years if the treatment is applicable to all of the contaminated surfaces.

8.6.2.6 Implementability

The technical feasibility of Alternative 17 is limited because isolation of the treatment area is difficult, and because hot gas treatment may compromise the integrity of a structure. Materials

undergoing treatment must be stable at operating temperatures and the debris segregated so that combustible materials are removed before the process begins. Alternative 17 assumes that all potential Army chemical agent is effectively treated to 3X by the hot gas treatment. The debris must be monitored for Army chemical agent after demolition. If agent is detected on combustible materials, hot gas treatment will not be applicable and other treatment will be necessary, which limits the effectiveness of this alternative. To date, hot gas treatment has only been developed at the pilot scale, and its effectiveness at full scale is unknown. In addition, the technology is not commercially available and technical expertise is limited. The alternative is administratively feasible.

8.6.2.7 Cost

The cost of this alternative includes air monitoring for analytical verification of the effectiveness of the treatment and incineration treatment of the emitted gas. There are 67 structures amenable to this alternative. The present worth cost of this alternative is approximately $256,000,000, which includes transportation to an on-post hazardous waste landfill.

8.7 ALTERNATIVE 18: DISMANTLING, PEROXIDE/HYPOCHLORITE TREATMENT, ON-POST HAZARDOUS WASTE LANDFILL

8.7.1 Description of Alternative

This alternative includes dismantling the structure, administering peroxide/hypochlorite treatment to the debris, consolidating the debris in an on-post hazardous waste landfill, and backfilling the structure excavation.

The design of the post-demolition treatment system for this alternative is very similar to the one described in Alternative 17 (Section 8.6). Dismantled materials are loaded into sealable 20-CY-rolloffs in preparation for peroxide/hypochlorite treatment. Debris in each rolloff is monitored for agent, and those rolloffs containing agent-contaminated debris are designated for treatment. It was assumed that 5 percent of the materials show detections of agent at actionable levels. Debris that tests negative for treatment (3X) is directly consolidated at the on-post hazardous

waste landfill. Debris that tests positive for treatment is transported in the rolloffs to an on-post facility for peroxide/hypochlorite treatment. This facility may either be a structure designed and built specifically for the treatment or it may be an existing structure that meets the criteria for treatment. The debris is treated by filling the rolloffs with a peroxide/hypochlorite solution. Waste solution (caustic) from the treatment is drained from the rolloffs, collected, and treated as required. Analysis for potentially toxic byproducts in the spent caustic is performed before it is treated or disposed. Following peroxide/hypochlorite treatment, the debris is monitored for agent. If agent is detected, the debris undergoes further peroxide/hypochlorite treatment until agent is no longer detected. When the debris tests negative for agent, it is transported to the on-post hazardous waste landfill for disposal.

8.7.2 Analysis of Alternative

8.7.2.1 Overall Protection of Human Health and the Environment

This alternative is protective of human health and the environment through the treatment of structural debris using peroxide/hypochlorite treatment. Peroxide/hypochlorite is the most commonly used treatment process for agent-contaminated materials since it readily elevates the waste to 3X status.

8.7.2.2 Compliance with ARARs

This Alternative 18 complies with action- and location-specific ARARs. ARARs regarding hazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-8.

8.7.2.3 Long-Term Effectiveness and Permanence

There is low residual risk associated with this alternative due to the effective treatment of Army chemical agent. Because agent-contaminated materials are neutralized prior to landfilling, the adequacy and reliability of controls are enhanced by the peroxide/hypochlorite treatment. Wildlife habitat is limited at the landfill.

8.7.2.4 Reduction of TMV

Alternative 18 is effective in irreversibly reducing Army chemical agent TMV through the peroxide/hypochlorite treatment process. While the TMV of inorganic contaminants is not affected by peroxide/hypochlorite treatment, this alternative effectively reduces the mobility of these contaminants through the landfilling and long-term monitoring of the debris. A toxic liquid sidestream is produced that must be tested and properly disposed.

8.7.2.5 Short-Term Effectiveness

Worker protection is a concern during caustic washing, as is containment and disposal of the spent caustic. The nature of the debris (porous versus nonporous), may necessitate re-treatment to achieve 3X status. Off gases and liquid treatment residuals need to be treated and disposed properly to ensure the health and safety of the community during remediation. RAOs are achieved in 1 to 5 years.

8.7.2.6 Implementability

Alternative 18 is technically and administratively feasible. Containment and disposal of spent caustic is an implementation concern. Services and expertise for caustic washing are available.

8.7.2.7 Cost

The cost of Alternative 18 includes air monitoring for analytical verification of the effectiveness of the treatment and activated carbon adsorption treatment of the emitted gas. There are 67 structures that are amenable to this alternative. The present worth cost of this alternative is approximately $122,000,000, which includes transportation to an on-post hazardous waste landfill.

8.8 ALTERNATIVE 18a: SAND BLASTING, DISMANTLING, PEROXIDE/HYPOCHLORITE TREATMENT, ON-POST HAZARDOUS WASTE LANDFILL

8.8.1 <u>Description of Alternative</u>

Alternative 18a includes sand blasting, dismantling the structure and treating the debris using peroxide/hypochlorite, disposing of the debris in an on-post hazardous waste landfill, and

backfilling the structure excavation. This alternative is similar to Alternative 18, although in situ sand blasting has been added to allow the treatment of contaminants other than Army chemical agent.

8.8.2 Analysis of Alternative

8.8.2.1 Overall Protection of Human Health and the Environment

Alternative 18a is protective of human health and the environment as described in Section 8.7. Sand blasting is effective for other contaminants of interest in this medium group that are not treated by caustic washing.

8.8.2.2 Compliance with ARARs

This alternative complies with action- and location-specific ARARs, and it meets the BDAT for debris treatment. ARARs regarding sand blasting are presented in the Technology Description Volume, Appendix A, Table A-28, and ARARs regarding hazardous waste landfills are presented in the Technology Description Volume, Appendix A, Table A-8.

8.8.2.3 Long-Term Effectiveness and Permanence

There is low residual risk associated with this alternative as discussed in Section 8.7. The residual risk and adequacy of controls is enhanced by sand blasting if contaminants other than Army chemical agent are present.

8.8.2.4 Reduction of TMV

A solid waste stream is produced from the grit and removed structural material. This alternative is effective in irreversibly reducing Army chemical agent TMV through the peroxide/hypochlorite treatment process, although a toxic liquid sidestream is produced. Conversely, sand blasting removes surficial contaminants, reducing only the mobility and volume of the contaminants by removing them from the structure. Furthermore, waste sand-blasting materials may require peroxide/hypochlorite treatment, so the resulting waste stream must be characterized and disposed.

8.8.2.5 Short-Term Effectiveness

Worker protection is a concern during sand blasting and caustic washing, as is containment and disposal of spent caustic. Air controls and monitoring are needed during treatment for community protection. RAOs are achieved in 1 to 5 years.

8.8.2.6 Implementability

Sand blasting is a concern in Army chemical agent structures since there is a possibility of liberating additional agent contamination from the subsurface during treatment. In addition, the complexity of the physical configuration of the structure (i.e., the inaccessibility of corners or recesses) could limit the effectiveness of the treatment. As a result, not all contaminated surfaces may be treated, depending on the configuration of each structure. Effectiveness of this alternative varies from structure to structure. The nature of the debris (porous verses nonporous), may necessitate retreatment to achieve 3X status. Off gases and liquid treatment residuals must be treated and disposed properly. Peroxide/hypochlorite technology is the most commonly used decontamination method for Army chemical agent, and materials are readily available. The alternative is administratively feasible.

8.8.2.7 Cost

The cost of this alternative includes air monitoring for analytical verification of the effectiveness of the treatment and activated carbon adsorption treatment of the emitted gas. There are 67 structures amenable to this alternative. The present worth cost of Alternative 18a is approximately $122,000,000, which includes transportation to an on-post hazardous waste landfill.

Table 8.0-1 Comparative Analysis of Alternatives, No Future Use, Agent History Medium Group

Criteria	ALT. 1: No Action	ALT. 4: Hot Gas, Dismantling, On-Post Hazardous Waste Landfill
1. Overall protection of human health and environment	Not protective; does not achieve RAOs.	Protective; treatment limited to organics on nonflammable surfaces. Debris contained by landfilling.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidance	Does not comply with location-specific ARARs, action-specific ARARs do not apply.	Complies with action- and location- specific ARARs
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls –Habitat impacts	Risk and habitat unchanged. No controls used.	Low residual risk, structural debris contained by landfilling. Adequate controls, long-term monitoring required. Habitat improved at site, but limited at landfill.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	No reduction in TMV.	Hot gas irreversibly reduces TMV of organics on nonflammable surfaces. Off gases produced. Landfill reduces mobility, but may be reversible if landfill leaks.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	No worker protection necessary and no habitat improvement since no action taken. RAOs are not achieved.	Worker protection a concern for hot gas treatment, potentially toxic off gases produced. Dust controls needed for demolition. Positive habitat impacts at site. RAOs are achieved in 1 to 5 years.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Technically and administratively feasible.	Limited to nonflammable surfaces. May compromise structural integrity. Isolation of treatment area may be difficult. Administratively feasible. Hot gas services and expertise limited.
7. Cost[1] –Present worth cost	$0	$181,000,000

[1] Cost does not include ongoing activities described in Section 2.2.3 and listed in Table 9.4-4

ARARs Applicable or Relevant and Appropriate Requirements
CY Cubic Yards
RAO Remedial Action Objective
TMV Toxicity, Mobility, or Volume

Table 8.0-1 Comparative Analysis of Alternatives, No Future Use, Agent History Medium Group

Criteria	ALT. 6: Hot Gas, Dismantling, On-Post Rotary Kiln Incineration, On-post Nonhazardous Waste Landfill	ALT. 14: Dismantling, On-Post Hazardous Waste Landfill
1. Overall protection of human health and environment	Protective, debris treated by incineration, contained by landfilling.	Protectiveness limited, debris contained by landfilling, but agent not treated.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidance	Complies with action- and location-specific ARARs.	Complies with action- and location-specific ARARs, but may not satisfy Army regulations concerning agent handling.
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls	Low residual risk, incinerated debris nonhazardous. Adequate controls, long-term maintenance required.	Low residual risk only if agent not detected; structural debris contained by landfilling. Adequate controls, long-term monitoring required.
–Habitat impacts	Habitat improved at site, but limited at landfill.	Habitat improved at site, but limited at landfill.
4. Reduction in TMV through treatment –Treatment process used and materials treated	Hot gas irreversibly reduces TMV of organics on nonflammable surfaces. Off gases produced.	Debris not treated, no reduction in toxicity or volume.
–Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	Incineration irreversibly reduces TMV, renders debris nonhazardous. Off gases are produced.	Landfilling reduces mobility, but may be reversible if landfill leaks.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	Worker protection a concern for hot gas treatment, potentially toxic off gases produced. Dust controls needed for demolition. Air controls needed for incineration. Positive habitat impacts at site. RAOs are achieved in 1 to 5 years.	Dust control needed for demolition. Positive habitat impacts at site. RAOs are achieved in 1 to 5 years.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Limited to nonflammable surfaces. May compromise structural integrity. Isolation of treatment area difficult. Administratively feasible. Hot gas services and expertise limited.	Technically and administratively feasible, but may not satisfy Army regulations concerning agent handling. Materials and services readily available.
7. Cost[1] –Present worth cost	$216,000,000	$113,000,000

[1] Cost does not include ongoing activities described in Section 2.2.3 and listed in Table 9.4-4

ARARs Applicable or Relevant and Appropriate Requirements
CY Cubic Yards
RAO Remedial Action Objective
TMV Toxicity, Mobility, or Volume

Table 8.0-1 Comparative Analysis of Alternatives, No Future Use, Agent History Medium Group

Criteria	ALT. 15: Dismantling, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill	ALT. 17: Dismantling, Hot Gas, On-Post Hazardous Waste Landfill
1. Overall protection of human health and environment	Protective, debris is treated by incineration, contained by landfilling.	Protective, treatment limited to organics on nonflammable debris surfaces. Debris contained by landfilling.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidance	Complies with action- and location-specific ARARs.	Complies with action- and location-specific ARARs
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls –Habitat impacts	Low residual risk, incinerated debris nonhazardous. Adequate controls, long-term maintenance required. Habitat improved at site, but limited at landfill.	Low residual risk, structural debris contained by landfilling. Adequate controls, long-term monitoring required. Habitat improved at site, but limited at landfill.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	Incineration irreversibly reduces TMV. Debris is rendered nonhazardous. Off gases are produced. Landfilling reduces mobility, but may be reversible if landfill leaks.	Hot gas irreversibly reduces TMV of organics on nonflammable debris surfaces. Off gases are produced. Landfilling reduces mobility, but may be reversible if landfill leaks.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	Dust controls needed for demolition. Air controls needed for incineration. Positive habitat impacts at site. RAOs are achieved in 1 to 5 years.	Worker protection a concern for hot gas treatment, potentially toxic off gases produced. Dust controls needed for demolition. Positive habitat impacts at site. RAOs are achieved in 1 to 5 years.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Technically and administratively feasible. Services and materials readily available.	Hot gas limited to nonflammable debris surfaces. Isolation of treatment area may be difficult. Administratively feasible. Hot gas services and expertise limited.
7. Cost[1] –Present worth cost	$164,000,000	$256,000,000

[1] Cost does not include ongoing activities described in Section 2.2.3 and listed in Table 9.4-4

ARARs Applicable or Relevant and Appropriate Requirements
CY Cubic Yards
RAO Remedial Action Objective
TMV Toxicity, Mobility, or Volume

Table 8.0-1 Comparative Analysis of Alternatives, No Future Use, Agent History Medium Group

Criteria	ALT. 18: Dismantling, Peroxide/ Hypochlorite Treatment, On-Post Hazardous Waste Landfill	ALT. 18a: Sand Blasting, Dismantling, Peroxide/ Hypochlorite Treatment, On-Post Hazardous Waste Landfill
1. Overall protection of human health and environment	Protective, treatment limited to surface Army chemical agent, debris contained by landfilling.	Protective, surface contaminants and Army chemical agent treated, debris contained by landfilling.
2. Compliance with ARARs –Action-specific ARARs –Location-specific ARARs –Criteria, advisories, and guidance	Complies with action- and location-specific ARARs.	Complies with action- and location-specific ARARs.
3. Long-term effectiveness and permanence –Magnitude of residual risks –Adequacy and reliability of controls –Habitat impacts	Low residual risk, structural debris contained by landfilling. Adequate controls, long-term monitoring required. Habitat improved at site, but limited at landfill.	Low residual risk, structural debris contained by landfilling. Adequate controls, long-term monitoring required. Habitat improved at site, but limited at landfill.
4. Reduction in TMV through treatment –Treatment process used and materials treated –Degree and quantity of TMV reduction –Irreversibility of TMV reduction –Type and quantity of treatment residuals	Caustic wash irreversibly reduces TMV of Army chemical agent on surfaces of materials No other contaminants treated. Toxic liquid side stream produced. Landfilling reduces mobility, but may be reversible if landfill leaks.	Sand blasting removes surface contaminants. Solid waste stream produced. Caustic wash irreversibly reduces TMV of surface army agent. Toxic liquid side stream produced. Landfilling reduces mobility, but may be reversible if landfill leaks.
5. Short-term effectiveness –Protection of workers during remedial action –Protection of community during remedial action –Environmental impacts of remedial actions –Time until RAOs are achieved	Worker protection a concern for caustic washing. Containment and disposal of spent caustic a concern. Dust controls needed for demolition. Positive habitat impact at site. RAOs are achieved in 1 to 5 years.	Worker protection a concern for caustic washing and sand blasting. Containment and disposal of caustic a concern. Dust controls needed for demolition. Positive habitat impacts at site. RAOs are achieved in 1 to 5 years.
6. Implementability –Technical feasibility –Administrative feasibility –Availability of services and materials	Containment and disposal of caustic a concern. Administratively and technically feasible. Caustic washing services available.	Containment and disposal of caustic a concern. Sand blasting a concern for Army chemical agent structures. Administratively feasible. Caustic washing services limited.
7. Cost[1] –Present worth cost	$122,000,000	$122,000,000

[1] Cost does not include ongoing activities described in Section 2.2.3 and listed in Table 9.4-4

ARARs Applicable or Relevant and Appropriate Requirements
CY Cubic Yards
RAO Remedial Action Objective
TMV Toxicity, Mobility, or Volume

9.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

9.1 NO FUTURE USE, MANUFACTURING HISTORY–PROCESS HISTORY SUBGROUP

There were 12 alternatives analyzed for the Process History Subgroup (Table 1.2-1). Alternative 1, No Action and Alternative 2, Pipe Plugs, Locks/Boards/Fences/Signs were removed from the selection process because these alternatives are not compatible with the alternatives chosen for the soils media, which necessitate the removal of structures to reach the underlying soils for remediation (Section 2.3). The remaining ten alternatives, which involve the removal and disposal of the structures, are compared in the following sections.

9.1.1 Overall Protection of Human Health and the Environment

All of the alternatives provide adequate protection of human health and the environment since the resulting structural debris is contained by landfilling, capping, or consolidation. On-post disposal of the debris is more protective than off-post disposal because on-post disposal offers direct control over long-term waste management and because off-site transportation is not necessary, which adds to the protection of the community .

9.1.2 Compliance with ARARs

As described in the individual analyses of the alternatives, each of the alternatives is in compliance with all applicable ARARs.

9.1.3 Long-Term Effectiveness and Permanence

The residual risk for each of the alternatives is low since the ultimate disposition of the debris is through landfilling, capping, or consolidation. Treatment of the structures prior to demolition does not lower the residual risk significantly since the in situ treatments do not destroy the contaminants present, but merely remove them from structural surfaces. Incineration of the debris does destroy contaminants, but the resulting ash may still be hazardous if heavy metal contamination is present.

Landfilling, capping, or consolidation of the structural debris provides adequate controls for the debris. If the ultimate disposal area is on post, long-term monitoring and maintenance of the disposal area is necessary to maintain adequate controls. If the ultimate disposal area is off post, long-term monitoring and maintenance is included in the disposal cost, although there is no direct control of the waste management.

Since each of the ten alternatives includes the removal of structures, the habitat is improved at the location of the structure. If the ultimate disposal area is on post, the habitat is limited at the disposal location due to the need to exclude burrowing animals from the landfill or capping area.

9.1.4 Reduction of TMV

All of the treatments offer some degree of irreversible reduction in contaminant TMV. All of the treatment technologies have limitations in that they are only applicable to certain contaminants on certain surfaces. Hot gas treatment is only applicable for organic contaminants on nonflammable surfaces. Vacuum dusting is only amenable to contaminants associated with dust that is not bound to a surface. Steam cleaning is only amenable to contaminants on nonporous surfaces. Sand blasting is amenable to near-surface contamination on most surfaces, and is the most universally applicable in situ treatment for the structures medium. Incineration, which treats structural debris, is not amenable wastes to contaminated with metals, although it offers the greatest degree of irreversible reduction in contaminant TMV.

Landfilling, capping, or consolidation offers a reduction in mobility for all contaminants through containment. The reduction in mobility may be reversed if the disposal area leaks. Proper long-term monitoring and maintenance of the disposal area can prevent leakage from occurring.

Hot gas treatment produces large quantities of potentially toxic off gases that must be collected and treated. Vacuum dusting and sand blasting produce potentially hazardous solid waste streams, although sand blasting produces more waste than vacuum dusting since the process removes part of the surface being treated. Steam cleaning produces a potentially hazardous liquid

sidestream. Incineration not only produces a gaseous sidestream that must be treated but ash that may still be considered hazardous.

Landfilling, capping, and consolidation may produce gaseous and liquid (leachate) sidestreams due to decomposition of organic materials. These volumes are small compared to the volume of waste and are produced slowly over time.

9.1.5 Short-Term Effectiveness

For demolition, standard worker protection is necessary both for physical and chemical hazards. All treatments require worker protection. Worker protection for hot gas treatment is a concern due to the aggressive nature of the treatment.

The off gases produced from hot gas treatment and incineration must be captured and treated to ensure the health and safety of the community. Contaminated dust, however, is the greatest concern for the community. Dust controls during demolition and transportation activities are necessary to protect the community during remedial actions.

The environmental impacts associated with these remedial alternatives are low if the dust that is produced is adequately controlled. The time needed to complete any of these alternatives is short, less than 5 years, which lessens the environmental impact. Alternatives that do not involve treatment have less of an impact because the period of performance is shorter and because there are no potentially hazardous treatment sidestreams and residuals produced.

For all ten of the alternatives, RAOs are achieved in less than 5 years. RAOs are achieved most rapidly by disposing the debris on post without treatment.

9.1.6 Implementability

All of the alternatives are technically feasible to some degree. Demolition, transportation, and landfilling or capping are all standard technologies that are technically feasible. Section 9.1.4

describes the limitations of the treatment technologies. In hot gas treatment, isolation of the treatment area and the possibility for compromising the integrity of a structure limits the technical feasibility for that treatment technology.

All of the alternatives are administratively feasible. There are long-term liability concerns associated with off-post disposal of debris since there is no direct control over long-term waste management.

Services and materials are readily available for all options except hot gas. Since hot gas treatment is still under development, expertise and services are very limited.

9.1.7 Cost

The majority of the cost for these alternatives is related to activities associated with demolition, transportation, and disposal. Off-post transportation and disposal is significantly more expensive than on-post disposal. In situ treatments (vacuum dusting, steam cleaning, and sand blasting) do not add appreciably to the costs. Hot gas treatment and incineration are capital-intensive treatment technologies that add significantly to the cost of an alternative. Off-post incineration is the most expensive treatment option. Costs range from a high of $528,000,000 for Alternative 12 (which involves off-post incineration and disposal) to $30,900,000 for Alternative 21a (which involves demolition and consolidation of the debris with the soils medium). The cost of IRAs and ongoing actions described in Section 2.2.3 and listed in Table 9.4-4 not included in the remediation costs.

9.2 NO FUTURE USE, MANUFACTURING HISTORY–NON-PROCESS HISTORY SUBGROUP

Six alternatives were analyzed for the Non-Process History Subgroup (Table 1.2-1). Alternative 1, No Action and Alternative 2a, Locks/Boards/Fences/Signs were not retained for evaluation as the preferred alternative. These alternatives leave the structures in place and do not provide a permanent solution since the structures require long-term maintenance and present

a continued physical hazard. In addition, many of the structures in this medium group must be removed to allow soils remediation to proceed. The remaining four alternatives, which involve removing the structures and disposing of the debris, are compared in the following sections. The range of alternatives for this subgroup is similar to the range of alternatives for the Process History Subgroup except that treatment alternatives are not necessary prior to disposal of structure debris.

9.2.1 Overall Protection of Human Health and the Environment

All of the alternatives provide adequate protection of human health and the environment since the resulting structural debris is contained by landfilling, capping, or consolidation. On-post disposal of the debris is more protective than off-post disposal because on-post disposal offers direct control over long-term waste management.

9.2.2 Compliance with ARARs

As described in the individual analysis of the alternatives, each of the alternatives is in compliance with all applicable ARARs.

9.2.3 Long-Term Effectiveness and Permanence

The residual risk for each of the alternatives is very low since the ultimate disposition of the debris is through landfilling, capping, or consolidation, and the resulting debris from these structures is expected to be nonhazardous.

Landfilling, capping, or consolidation of the structural debris provides adequate controls for the debris. If the ultimate disposal area is on post, long-term monitoring and maintenance of the disposal area is necessary to maintain adequate controls. If the ultimate disposal area is off post, long-term monitoring and maintenance is included in the disposal cost, although there is no direct management of the waste.

Since all four of the alternatives include the removal of structures, the wildlife habitat is improved at the location of the structure under any of the alternatives. If the ultimate disposal area is on post, the habitat is limited at the disposal location due to the need to exclude burrowing animals from the landfill or capping area.

9.2.4 Reduction of TMV

Since the structural debris from this subgroup is expected to be nonhazardous, reduction in TMV is not applicable.

Landfilling, capping, and consolidation may produce gaseous and liquid (leachate) sidestreams due to decomposition of organic materials. These volumes are small compared to the volume of waste and are produced slowly over time.

9.2.5 Short-Term Effectiveness

Standard worker protection is necessary during demolition for both physical and chemical hazards. Contaminated dust is the greatest concern for the community. Even though the structures in this subgroup are not expected to be contaminated, they are in production areas and contaminated dust may be generated from the surrounding area. Dust controls during demolition and transportation activities are necessary to protect the community during the remedial action.

The environmental impacts associated with these remedial alternatives are low, assuming that the dust produced is adequately controlled. The time needed to complete any of these alternatives is less than 5 years, which lessens the environmental impact. Since these alternatives do not involve treatment, and the structures in this subgroup are assumed to be free from contamination, the environmental impacts are very low.

RAOs are achieved in less than 5 years for all of the alternatives. RAOs are achieved most rapidly by disposing the debris on post.

9.2.6 Implementability

All of the alternatives are technically feasible. Demolition, transportation, and landfilling or capping are all standard technologies that are technically feasible.

All of the alternatives are administratively feasible. There are long-term liability concerns associated with off-post disposal of the debris since there is no direct control over long-term waste management. Services and materials for these options are readily available.

9.2.7 Cost

The costs for these alternatives are based primarily on activities associated with demolition, transportation, and disposal. Off-post transportation and disposal is significantly more expensive than on-post disposal. Hazardous waste disposal is more expensive and may not be necessary for the structures in this medium group. The costs range from $13,900,000 for Alternative 19a (which involves demolition and disposal on-site) to $8,630,000 for Alternative 2a (which involves locks, boards, fences, and signs). The cost of IRAs and ongoing actions described in Section 2.2.3 listed in Table 9.4-4 are not included in the remediation costs.

9.3 NO FUTURE USE, AGENT HISTORY MEDIUM GROUP

Eight alternatives were analyzed for the No Future Use, Agent History Medium Group (Table 1.2-2). Alternative 1, No Action was removed from the selection process because this alternative leaves the structures in place, and does not provide a permanent solution since the structures require long-term maintenance and present a continued physical hazard. In addition, many of the structures in this medium group must be removed to allow soils remediation to proceed. The remaining seven alternatives, which involve removing the structures and disposing of the debris, are compared in the following sections.

9.3.1 Overall Protection of Human Health and the Environment

The seven remaining alternatives can potentially satisfy AR 385-131 and therefore provide adequate protection of human health and the environment. The resulting structural debris is

contained in an on-post hazardous waste landfill or is incinerated and then contained in an on-post nonhazardous waste landfill.

9.3.2 Compliance with ARARs

Each of the alternatives is in compliance with all applicable ARARs. It should be noted that Alternative 14 is only in compliance if no Army chemical agent is detected at actionable levels.

9.3.3 Long-Term Effectiveness and Permanence

The residual risk for all of the alternatives is low since the ultimate disposition of the debris occurs at an on-post landfill. The disposal of the structural debris in an on-post landfill provides adequate controls for the debris. Since the ultimate disposal area is on post, long-term monitoring and maintenance of the disposal area is necessary to maintain adequate controls.

Since all alternatives include the removal of structures, the habitat is improved at the former location of the structure. The habitat, however, is limited at that location due to the need to exclude burrowing animals from the landfill area.

9.3.4 Reduction of TMV

All of the treatments offer some degree of irreversible reduction in contaminant TMV. All of the treatment technologies have limitations that are only applicable to certain contaminants on certain surfaces, and most of the treatment technologies are geared to the treatment of Army chemical agent. Hot gas treatment is only amenable to Army chemical agent and other organic contaminants on nonflammable surfaces. Peroxide/hypochlorite treatment is the most commonly used method for treating agent-contaminated material. Sand basting is amenable to near-surface contamination on most surfaces. Sand blasting is the most universally applicable in situ treatment for the structures medium, although additional treatment of the waste may be necessary if agent is present. Peroxide/hypochlorite and hot gas treatments elevate agent-contaminated waste to a 3X status, which allows the waste to be disposed in a hazardous waste landfill. Incineration, however, elevates agent-contaminated waste to a 5X status, which allows the waste

to be disposed in a nonhazardous waste landfill. Incineration, therefore, offers the greatest degree of irreversible reduction in chemical agent TMV.

Landfilling offers a reduction in mobility for all contaminants through containment. The mobility reduction can be reversed if the landfill leaks. Proper long-term monitoring and maintenance of the landfill can prevent leakage from occurring.

Hot gas treatment produces large quantities of potentially toxic off gases that must be collected and treated. Sand blasting produces potentially hazardous solid waste streams that may contain Army chemical agent. Incineration not only produces a gaseous sidestream that must be treated but also ash that may still be considered hazardous.

Landfilling may produce gaseous and liquid (leachate) sidestreams due to decomposition of organic materials. These volumes are small compared to the volume of waste and are produced slowly over time.

9.3.5 Short-Term Effectiveness

Worker protection is necessary during demolition for both physical and chemical hazards, and must include protection for possible agent contamination. All treatments require worker protection for Army chemical agent. Worker protection for hot gas treatment is a concern due to the aggressive nature of the treatment.

The off gases produced from hot gas treatment and incineration must be captured and treated to ensure the health and safety of the community. Contaminated dust, however, is the greatest concern for the community. Dust controls during demolition and transportation activities are necessary to protect the community during the remedial action.

The environmental impacts associated with these remedial alternatives are low assuming that the dust produced is adequately controlled. The time needed to complete any of these alternatives

is less than 5 years, which lessens the environmental impact. Alternatives that do not involve treatment have a lower impact because these alternatives are completed more rapidly and because there are no potentially hazardous treatment sidestreams and residuals produced. RAOs are achieved in less than 5 years for all seven of the alternatives.

9.3.6 Implementability

All of the alternatives are technically feasible to some degree. Demolition, transportation, and landfilling or capping are all standard technologies that are technically feasible. Section 9.3.4 describes the technical limitations of the treatment technologies. Isolation of the treatment area and the possibility of compromising the integrity of a structure during hot gas treatment limits the technically feasibility of that treatment technology, and the possibility of liberating additional Army chemical agent contamination from the subsurface during sand blasting limits the technical feasibility of that treatment technology. All of the alternatives are administratively feasible. Services and materials are readily available except for those associated hot gas treatment. Since hot gas treatment is still under development, expertise and services are very limited.

9.3.7 Cost

The majority of the costs for these alternatives is related to demolition, transportation, and disposal. In situ treatment of sand blasting does not appreciably add to the costs. Hot gas treatment and incineration are capital-intensive treatment technologies that significantly add to the cost of alternatives. The costs range from $256,000,000 for Alternative 17 (which involves demolition, hot gas treatment, and disposal) to $113,000,000 for Alternative 14 (which involves no treatment and disposal of the waste in an on-post hazardous waste landfill). The cost of IRAs and ongoing actions described in Section 2.2.3 listed in Table 9.4-4 are not included in the remediation costs.

9.4 SELECTION OF PREFERRED ALTERNATIVES

9.4.1 No Future Use, Manufacturing History–Process History Subgroup

The preferred alternative for the Process History Subgroup is Alternative 21a, consolidation of the structural debris in Basin A without treatment at a cost of $30,900,000. The treatment of the structures does not add significantly to the overall protectiveness and permanence of the alternatives. On-post disposal is advantageous over off-post disposal due both to cost savings associated with on-post disposal and to the reduced long-term liability due to the direct control over long-term monitoring and maintenance. Consolidation of the debris integrates well with the preferred alternatives for the soils medium. The addition of structural debris can act as a barrier to burrowing animals, which is necessary in capped areas. Table 9.4-1 summarizes the selection process for the Process History Subgroup.

On February 16, 1993, the EPA issued an important new RCRA rule called Corrective Action Management Units and Temporary Units; Corrective Action Provisions; Final Rule (CAMU rule) that can increase flexibility for RCRA and Superfund cleanups (58 Fed. Reg. 8658). It allows EPA (RAs) to define Corrective Action Management Units (CAMUs) within which RCRA land disposal restrictions (LDRs) and Minimum Technology Requirements (MTRs) do not apply. It also allows RAs to define Temporary Units (TUs) to be used for storing or treating hazardous wastes at a facility for RCRA corrective action purposes. It is a final rule and it became effective April 15, 1993. If LDRs become an issue, treatment to comply with the RCRA Debris Rule both prior to and after demolition would be advantageous since treated structural material would be considered nonhazardous. If this happens, the most feasible treatment method would be sand blasting.

9.4.2 No Future Use, Manufacturing History–Non-Process History Subgroup

The preferred alternative for the Non-Process History Subgroup is Alternative 21a, consolidation of the debris in Basin A without treatment at a cost of $10,600,000. The rationale for selecting this alternative is the same as discussed in Section 9.4.1. Since the debris associated with these

structures is expected to be nonhazardous, treatment is not necessary. Table 9.4-2 summarizes the selection process for the Non-Process History Subgroup.

9.4.3 No Future Use, Agent History Medium Group

The preferred alternative for the Agent History Medium Group is Alternative 18, demolition followed by a caustic wash of any debris that does not meet the requirements for 3X status and placement in a separate cell in an on-post hazardous waste landfill at a cost of $122,000,000. The selection of this alternative assumes that air monitoring for Army chemical agent is performed before and after demolition to confirm 3X status of the structural debris. Only the materials that fail 3X air monitoring criteria are treated by the caustic wash. The direct control afforded by on-post landfilling is also advantageous for structures within this medium group. Table 9.4-3 summarizes the selection process for the Agent History Medium Group.

9.5 RISK MANAGEMENT ISSUES

Since high-level contamination is not expected to be associated with the majority of the structures, the risks associated with short-term worker and community exposure, as well as the long-term risks associated with waste management, are expected to be low. Selected portions of the process history structures, however, have the potential for containing low levels of organochlorine pesticides (OCPs) and metals, and there is potential for encountering chemical residues in process piping and tanks that are being removed under chemical-process-related activities. Moreover, there are unique risk management concerns associated with the potential presence of Army chemical agent in structures. Accordingly, this section addresses risk management issues associated with the preferred alternatives selected for the No Future Use, Manufacturing History and No Future Use, Agent History Medium Groups.

The No Future Use, Manufacturing History Medium Group consists of 788 structures divided into two subgroups: process history (365 structures) and non-process history (423 structures). The preferred alternative for both of these subgroups is the demolition of structures and the subsequent consolidation of the debris. Dust controls are necessary for the protection of site

workers and the community. Removing and disposing the structures has significantly less long-term risk than leaving the structures in place and restricting access to them. In addition, the majority of the structures must be removed to accommodate the soils remedial alternatives.

Disposing the debris on post offers better control over waste placement and management than does off-post disposal. Therefore, on-post disposal offers a lower long-term risk than off-post disposal. Since the majority of the debris is expected to be nonhazardous, the differences in risk associated with landfilling or capping versus consolidation is minimal. In addition, treating the debris does not lower long-term risk significantly and may increase the short-term exposure potential for site workers. However, if post-demolition sampling detects contaminants above the action levels set by the final ARARs, waste treatment may be required prior to placement.

The No Future Use, Agent History Medium Group consists of 67 structures. In general, the risk management issues for these structures are similar to the issues that pertain to the No Future Use, Manufacturing History Medium Group, but there are also concerns unique to structures with potential Army chemical agent presence.

The preferred alternative for this medium group includes demolishing the structures, administering peroxide/hypochlorite treatment of the debris as necessary, and disposing of the debris in an on-post hazardous waste landfill. Air monitoring and dust controls are necessary for the protection of site workers and the surrounding community. The short-term risks associated with demolition are potentially high due to the possible release of Army chemical agent. The highest probability of encountering agent residues is in process piping and tanks, which are currently being treated and removed as part of the chemical-process-related activities. The potential for encountering agent associated with building materials is low.

9.6 SUMMARY OF PREFERRED ALTERNATIVES FOR THE STRUCTURES MEDIUM

Tables 9.4-1 through 9.4-3 summarize the preferred alternatives for the structures medium groups/subgroups. Table 9.4-4 summarizes the costs for the preferred alternatives and the costs

for ongoing actions/IRAs that are an integral part of the structures remediation. The present worth cost for structures remediation, including on-going actions/IRAs, is $294,000,000. The total cost for structures remediation, including on-going actions/IRAs, is $297,000,000. Refer to Sections 4 through 8 for the descriptions and evaluations of the alternatives applicable to each medium group or subgroup.

The selection of alternatives for the structures medium considers the statutory requirements of CERCLA and the expectations of the National Contingency Plan (NCP), which states that the selected alternative must:

- Protect human health and the environment
- Comply with ARARs unless a waiver is justified
- Be cost effective
- Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable
- Satisfy the preference for treatment as a principal element (of the remedy), or provide an explanation in the ROD why the preference was not met.

The preferred alternatives for the structures medium include dismantling the structures and containing the debris on post. The majority of the debris is expected to be nonhazardous or contain low to undetectable levels of contamination, and so it is expected to pose a relatively low long-term risk. However, sampling or treatment is conducted to comply with any ARARs.

9.6.1 Cost

All costs were developed in accordance with EPA guidance (EPA-OERR 1988b). There are several on-going activities that are not included in the remediation cost developed in this document. The costs of these activities, listed in Table 9.4-4, contribute significantly to the total cost of structures remediation. The estimated cost to complete the ongoing activities is $130,000,000, which is slightly more than the estimated $167,000,000 remedial cost in the

feasibility study (FS). In addition, there are several other indirect costs that are not reflected in the cost estimate. These include the following:

- The cost of operating and maintaining the future use structures
- The cost of managing nonmanufacturing structures that are outside the CERCLA process
- The cost of operating RMA throughout the duration of the remediation.

The costs discussed above, will add to the total remediation costs for structures.

As discussed in Section 6 of the Technology Description Volume a centralized landfill was evaluated. The landfill was sized based on the largest volume of contaminated soil and structural debris from the landfill alternatives for the soils and structures media (7.5 million BCY). Based on the preferred alternatives for the structures and soils media the volume of material that will be landfilled is 1.0 million BCY; thus the size of the landfill facility can be reduced. The adjustments to the landfill construction cost are discussed in Section 20 of the soils volume.

9.6.2 Phasing

The remediation of RMA is an integral process involving soil, water, and structures media (Section 2.3). In general, the majority of the structures must be removed in order to access and remediate underlying or adjacent soils. The structures demolition must begin in the areas that the soils remediation needs to access so that the soils remediation schedule is not impacted. In addition, the structures demolition must be coordinated with the construction dewatering effort in South Plants so that the heavy equipment and manpower necessary for demolition do not adversely affect well and transfer line placement and operation. In addition, structures covered under any chemical weapons agreements may need to be removed first to comply with the requirements of the agreements.

The demolition of structures is a relatively rapid process. Basin A and the hazardous waste landfill may not be ready to accept waste during the time frame that the structures demolition occurs, so structural debris may have to be stockpiled prior to disposal. In general, structures must be removed first in order to ensure the efficient execution of the remediation of the other

media. Since the time frame needed to demolish the structures is relatively short, structures remediation should not hinder the remainder of the remediation efforts.

Table 9.4-1 Summary of Preferred Alternatives, No Future Use, Manufacturing History Medium Group – Process History Subgroup

Subgroup Name	Retained Alternatives from DSA	Preferred Alternative	Rationale for Selection
Process History	1: No Action (NA1) 2: Pipe Plugs, Locks/Boards/Fences/Signs (NA2) 8: Hot Gas, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill (NA8) 9: Vacuum Dusting, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill (NA9) 9a: Steam Cleaning, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill (NA9a) 10: Sand Blasting, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill (NA10) 12: Dismantling, Salvage, Off-Post Rotary Kiln Incineration, Off-Post Hazardous Waste Landfill (NA12) 13: Dismantling, Salvage, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill (NA13) 19: Dismantling, Salvage, On-Post Hazardous Waste Landfill (NA19) 20: Dismantling, Salvage, Off-Post Hazardous Waste Landfill 21: Dismantling, Salvage, Clay Cap (NA21) 21a: Dismantling, Salvage, Consolidation (NA21a)	21a: Dismantling, Salvage, Consolidation (NA21a)	Achieves threshold criteria; cost-effective alternative. Long-term effectiveness enhanced by removal of structures. Consolidation integrates well with several soils alternatives. The cost of this alternative is $30,900,000.[1]

[1] Cost does not include ongoing activities described in Section 2.2.3 and listed in Table 9.4-4.

DSA Development and Screening of Alternatives

Table 9.4-2 Summary of Preferred Alternatives, No Future Use, Manufacturing History Medium Group – Non-Process History Subgroup

Subgroup Name	Retained Alternatives from DSA	Preferred Alternative	Rationale for Selection
Non-Process History	1: No Action (NA1) 2a: Locks/Boards/Fences/Signs (NA2a) 19a: Dismantling, Salvage, On-Post Nonhazardous Waste Landfill (NA19a) 20a: Dismantling, Salvage, Off-Post Nonhazardous Waste Landfill (NA20a) 21: Dismantling, Salvage, Clay Cap 21a: Dismantling, Salvage, Consolidation (NA21a)	21a: Dismantling, Salvage, Consolidation (NA21a)	Achieves threshold criteria; cost-effective. Long-term effectiveness enhanced by removal of structures. Consolidation integrates well with several soils alternatives. The cost of this alternative is $10,600,000.

1 Costs do not include the costs of ongoing activities described in Section 2.2.3 and listed in Table C-29.
DSA Development and Screening of Alternatives
(1) Same as Table 9.4-1

Table 9.4-3 Summary of Preferred Alternatives, No Future Use, Agent History Medium Group

Subgroup Name	Retained Alternatives from DSA	Preferred Alternative	Rationale for Selection
None	1: No Action (NH1) 4: Hot Gas, Dismantling, On-Post Hazardous Waste Landfill (NH4) 6: Hot Gas, Dismantling, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill (NH6) 14: Dismantling, On-Post Hazardous Waste Landfill (NH14) 15: Dismantling, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill (NH15) 17: Dismantling, Hot Gas, On-Post Hazardous Waste Landfill (NH17) 18: Dismantling, Peroxide/Hypochlorite, On-Post Hazardous Waste Landfill (NH18) 18a: Sand Blasting, Dismantling, Peroxide/Hypochlorite, On-Post Hazardous Waste Landfill (NH18a)	18: Dismantling, Peroxide/ Hypochlorite, On-Post Hazardous Waste Landfill (NH18)	Achieves threshold criteria; complies with AR 385-131. Long-term effectiveness enhanced by removal of structures. Separate cell in landfill may be required for 3X materials. The cost of this alternative is $122,000,000.[1]

[1] Cost does not include ongoing activities described in Section 2.2.3 and listed in Table 9.4-4.

DSA Development and Screening of Alternatives

Table .4-4 Cost Summary for Structures Remediation

Preferred Alternative	Medium Group	Present Worth Cost[1]	Total Cost[2]
21a: Dismantling, Salvage Consolidation	No Future Use, Manufacturing History - Process History	$30,900,00	$31,600,000
21a: Dismantling, Salvage Consolidation	No Future Use, Manufacturing History - Non-Process History	$10,600,000	$10,800,000
18: Dismantling, Peroxide/Hypochlorite Treatment, On-Post Hazardous Waste Landfill	No Future Use, Agent History	$122,000,000	$125,000,000
	Subtotal Remediation Costs	$164,000,000	$167,000,000
Ongoing Actions/IRAs			
Asbestos Removal		$55,000,000 (EST)	$55,000,000 (EST)
Chemical Process Related Activities		$40,000,000 (EST)	$40,000,000 (EST)
Aboveground Storage Tank Removal		$20,000,000 (EST)	$20,000,000 (EST)
Underground Storage Tank Removal		$10,000,000 (EST)	$10,000,000 (EST)
PCB Removal		$5,000,000 (EST)	$5,000,000 (EST)
	Subtotal IRA/Ongoing Actions Cost	$130,000,000 (EST)	$130,000,000 (EST)
	Total Estimated Remediation Cost for the Structures Medium	$294,000,000	$297,000,000

1 Present Worth Cost In 1995 Dollars
2 Total Cost In 1995 Dollars Does Not Include Present Worth Discount
IRA Interim Remedial Action
PCB Polychlorinated Biphenyl
EST Estimated Cost

10.0 REFERENCES CONSULTED

RIC 84066RO1
ACOE (U.S. Army Engineer District, Omaha Corps of Engineers). 1983, March. Evaluation of the existing and future flood potential on the Rocky Mountain Arsenal, Denver, CO. Prepared for: Rocky Mountain Arsenal.

AGEISS. 1993 March. Draft Final Future Use Structures Monitoring Protocol Version 2.1. Contract No. DAAA05-92C-0815. Prepared for Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup.

AGEISS. 1993 March. Draft Final No Future Use Structures Sampling and Analysis Protocol Version 2.1. Control No. DAAA05-92C-0015. Prepared for Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 [SARA]). Public Law 99-499.

DARCOM (U.S. Army Material, Development and Readiness Command). 1979. Safety Regulations for Chemical Agents H, HD, HT. DARCOM-R 385-31.

RIC 89026R01
EBASCO. 1988b, September. Final Report Hazardous Waste Land Disposal Facility Assessment, Task 27. Prepared for Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup.

RIC 88357R02
EBASCO. 1988c, September. Draft Final Master Treatability Plan, Version 2.1. Contract No. DAAK11-84-D-0017. Prepared for Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup.

RIC 88306R02
EBASCO. 1988d, October. Final Structures Survey Report, Volumes I-III. Contract No. DAAK11-84-D-0017, Task No. 24. Prepared for Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup.

RIC 89166R05
EBASCO. 1989b, June. LTS RMA Final Remedial Investigation Report Volume IX North Plants Study Area Version 3.3, Volumes I-III.

RIC 89166R04
EBASCO. 1989e, July. LTS RMA Final Remedial Investigation Report Volume VIII South Plants Study Area Version 3.3, Volumes I-VI.

EBASCO. 1990a, March. Final RIFS3 Work Plan, RMA On-Post Feasibility Study, Version 3.2, Contract No. DAAA15-88-0024. Prepared for U.S. Army Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup.

EBASCO. 1990b, May. Draft Final Human Health Exposure Assessment for Rocky Mountain Arsenal, Volumes I-VIII, Version 3.1. Contract No. DAAA15-88-D-0024. Prepared for U.S. Army Program Manager's Office for the Rocky Mountain Arsenal Contamination Cleanup.

EPA (U.S. Environmental Protection Agency) - Hazardous Waste Engineering Research Laboratory. 1985, March. Guide for Decontaminating Buildings, Structures, and Equipment at Superfund Sites. EPA/600/2-85/028. PB 85-201234.

EPA - Office of Emergency and Remedial Response (OERR). 1988a, August 8. CERCLA Compliance with Other Laws Manual, Draft Guidance. OSWER Directive 9234.1-01.

EPA - OERR. 1988b, October. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final. EPA/540/G-89/004. OSWER Directive 9355.3-01.

RIC 88203R01
ESE (Environmental Science and Engineering, Inc.) 1988a, April. Feasibility Study Technical Plan, Version 3.2. Contract No. DAAK11-84-D-0016, Task 28. Prepared for U.S. Army Program Manager's Office for Rocky Mountain Arsenal.

RIC 89068R01
FFA (Federal Facility Agreement Pursuant to CERCLA Section 120). 1989. Docket No. CERCLA VIII-89-13.

NCP (National Oil and Hazardous Substance Pollution Contingency Plan; Final Rule). 1990, March 8. 40 CFR Part 300.

RIC 85022401
Nickens and Associates. 1984, May 14. An Archeological Overview and Management Plan for Rocky Mountain Arsenal, Adams County, Colorado. Prepared for U.S. Army Material Development and Readiness Command.

RIC 89062R03
OHM (O.H. Materials Corporation). 1989, January 17. Asbestos Sampling Report for the Rocky Mountain Arsenal in Commerce City, Colorado.

RIC 88131R01
PMRMA (Program Manager for Rocky Mountain Arsenal). 1988a, March. Final Technical Program Plan FY 88 - FY 92 (Remedial Investigation/Feasibility Study/Interim Response Actions), Volumes I and II.

RIC 88329R02
PMRMA. 1988b, October. Final Decision Document for the Interim Response Action at the Rocky Mountain Arsenal Hydrazine Blending and Storage Facility.

RIC 89019R01
PMRMA. 1988c, December. Final Decision Document for the Interim Response Action for Building 1727 Sump at Rocky Mountain Arsenal.

RIC 89222R02
PMRMA. 1989, July. Final Interim Response Action Technical Plan, Asbestos Removal - Phase II - Removal. Version 3.0.

RCRA (Resource Conversation and Recovery Act of 1976). Title 42 U.S.C.

RIC 88340R02
RLSA (R.L. Stollar and Associates, Inc.). 1988, May. Biota Monitoring Technical Plan, Comprehensive Monitoring Program.

Settlement Agreement between the United States and Shell Oil Company concerning the Rocky Mountain Arsenal. 1989.

RIC 81324R03
USAEHA (U.S. Army Environmental Hygiene Agency). 1978, October. Investigation of Pesticide Levels in Various Buildings at Rocky Mountain Arsenal.

USFWS (U.S. Fish and Wildlife Service). 1989, December. Bald Eagle Management Area Map.

Woodward-Clyde Consultants. 1993, March. Draft Final Future Use Structures Pilot Study Report Structures Feasibility Study Sampling and Analysis Version 2.0 Contract No. DAAA15-88-D-0022 Task 0005. Prepared for the Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup.

Appendix A
Medium Group Structures Lists

LIST OF TABLES

Table A.1-1 Future Use, No Exposure

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0105	#	Bus Shelter	0	0	33
0111		RMA Administration, Hqs, Offices	770	39000	35
0112		Communication Headquarters	290	2300	35
0120	#	Facilities Maintenance Headquarters	0	0	35
0121	#		0	0	35
0124	#		0	0	35
0129	#		0	0	35
0133	#		0	0	35
0135	#		0	0	04
0143		West Gate Guardhouse	23	180	04
0145		South Gate Guardhouse	46	170	11
0211	$	Gas Meter House	21	240	02
0312		Fire Station Hqs	860	12000	36
0361	$	Primary Electrical Substation	54	380	02
0362	$	Warehouse	4000	59000	02
0370	#	Restroom	0	0	02
0371	$	Water Pumping Station	820	1800	02
0372		Million Gallon Reservoir (Potable)	530	21000	02
0372A	$	Chlorinator Station	56	380	02
0383		Community Club	340	6100	02
0618	$	Warehouse	5300	110000	03
0619	$	Warehouse	5200	110000	03
0702	#	Bald Eagle Observation Platform	0	0	05
NN0501		Abandoned School-fdn & wall	45	1300	05
NN0903		VORTAC Station	110	1000	09

$ - Remediation Use Structure
\# - Structure Added Since 1986, Not Part of Task 24(EBASCO, 1988)
rev 06/21/93

Table A.1-1 Future Use, No Exposure

Structure Number	Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
Total: 25		18465	364850	

$ - Remediation Use Structure
# - Structure Added Since 1986, Not Part of Task 24(EBASCO, 1988)
rev 06/21/93

Table A.1-2 No Future Use, Nonmanufacturing History

Structure Number	Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0136	Garage-to 134-foundation	3	130	35
0137	Garage-to 131-foundation	3	130	35
0148	Storage/Pass Office-NW of 166	1	410	34
0150	Tennis Courts	120	13000	34
0169B	Gas Station House-fdn-S of 150	4	100	34
0176	5-Unit Garage & Unused Apt-fndation	24	1500	03
0368	Swimming Pool & Filter House	640	1900	02
0373	Officer's Quarters	130	1100	02
0373B	Garage-to 373	42	720	02
0383A	Officer's Club Storage	16	82	02
0635	Admin Offices-Rocky Mtn Railcar	48	590	03
0644	NCO Quarters-foundation	17	1400	03
0644A	Garage/Storage-foundation	1	40	03
0647A	Motor Pool Dispatch Office	35	1000	04
0680	Radio Range B-foundation	2	49	09
0685	Guard Tower-SE of 673-foundation	6	64	03
0688	Guard Tower-E of 615-foundation	6	64	03
0836	Air Force Seismic Monitoring	590	7100	24
0851	Pistol Range House	6	250	19
NN2401	Concrete Structure-E of Bog	3	25	24
SS 0100	Substation-1T-30'N of 866	0	0	06
SS 0101	Substation-2T-200'NE of 866	0	0	06
SS 0102	Substation-1T-500'W of 867A	0	0	06
SS 0103	Substation-1T-700'W of 865	0	0	06

$ - Remediation Use Structure
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Structure Number	Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
SS 0104	Substation-1T-400'N of 872A	0	0	06
SS 0105	Substation-1T-NE of 867A	0	0	06
SS 0111	Substation-2T-N side 111	0	0	35
SS 0121	Substation-1T-NW corner of section	0	0	03
SS 0141	Substation-3T-E of 141	0	0	04
SS 0176	Substation-1T-W of Staff Quarters	0	0	03
SS 0370	Substation-1T-150'W of C	0	0	03
SS 0378	Substation-1T-N of 378	0	0	03
SS 0379	Substation-1T-SE of 379	0	0	03
SS 0385	Substation-3T-N of 385	0	0	04
SS 0386	Substation-3T-N of 386	0	0	04
SS 0387	Substation-3T-W of 387	0	0	04
SS 0391	Substation-3T-SE of 391	0	0	24
SS 0392	Substation-2T-W of 392	0	0	34
SS 0393	Substation-2T-S of 393	0	0	34
SS 0611	Substation-3T-S of 611	0	0	04
SS 0612	Substation-1T-E of 612	0	0	04
SS 0613	Substation-3T-NW of 613	0	0	04
SS 0614	Substation-1T-W of 614	0	0	03
SS 0616	Substation-3T-N of 614	0	0	03
SS 0618	Substation-3T-N of 618	0	0	03
SS 0618-2	Substation-1T-W of 618	0	0	03
SS 0619	Substation-4T-N of 619	0	0	03
SS 0622	Substation-1T-NE of 621	0	0	04

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Structure Number	Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
SS 0624	Substation-3T-E of 624	0	0	04
SS 0625	Substation-1T-E of 624	0	0	04
SS 0627	Substation-3T-E of 627	0	0	04
SS 0627A	Substation-1T-E of SS 627	0	0	04
SS 0629	Substation-3T-NE of 629	0	0	04
SS 0631	Substation-3T-N of 631	0	0	04
SS 0632	Substation-1T-NE of 632	0	0	04
SS 0633	Substation-3T-S of 633	0	0	04
SS 0634	Substation-3T-SE of 634	0	0	04
SS 0635	Substation-1T-W of 635	0	0	03
SS 0647	Substation-1T-E of 647A	0	0	03
SS 0673	Substation-1T-1200'NNE of 619	0	0	03
SS 0791-2	Substation-1T-E of 145	0	0	11
SS 0808ABC	Substation-3T-NE of 808	0	0	23
SS 0808D	Substation-1T-0.3 mi SW of 808	0	0	23
SS 0808E	Substation-1T-0.2 mi SW of 808	0	0	23
SS 0808F	Substation-1T-427'SSE of 808	0	0	24
SS 0808G	Substation-1T-800'SE of 808	0	0	24
SS 0808H	Substation-1T-0.36 mi ESE of 808	0	0	24
SS 0808I	Substation-1T-0.49 mi ESE of 808	0	0	24
SS 0808K	Substation-1T-0.68 mi ESE of 808	0	0	24
SS 0808L	Substation-1T-0.65 mi E of 808	0	0	24
SS 0809	Substation-3T-S of 809	0	0	33
SS 0809A	Substation-3T-300'SW of 809	0	0	33

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Structure Number	Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
SS 0809B	Substation-3T-200'W of 809	0	0	33
SS 0809C	Substation-3T-400'N of 809	0	0	33
SS 0809D	Substation-3T-700'NE of 809	0	0	33
SS 0809E	Substation-3T-500'E of 809	0	0	33
SS 0809F	Substation-3T-0.2 mi S of 809	0	0	33
SS 0831	Substation-3T-200'S of 8th & D St	0	0	35
SS 0831E	Substation-1T-538'SSE of 8th & D St	0	0	36
SS 0832	Substation-1T-300'E of 159	0	0	34
SS 0836	Substation-3T-S of 836	0	0	24
SS 1730	Substation-2T-NW of 1730	0	0	31
SS 1731	Substation-1T-200'NW of 1730	0	0	31
SS 1732	Substation-1T-NW corner of section	0	0	31
SS 1735	Substation-3T-E of 1736	0	0	31
SS 1736	Substation-2T-200'S of 1736	0	0	31
SS AL338	Substation-1T-SE corner of section	0	0	31
SS FL842 T	Substation-1T-N of 1618	0	0	25
SS NN2201	Substation-1T-640'NNW of 810	0	0	22
SS NN2202	Substation-1T-960'NNW of 810	0	0	22
SS NN2203	Substation-1T-1260'NW of 810	0	0	22
SS NN2204	Substation-1T-1600'NW of 810	0	0	22
SS NN2205	Substation-1T-2050'NW of 810	0	0	22
SS NN2206	Substation-1T-2500'NW of 810	0	0	22
SS NN2207	Substation-1T-800'WNW of 810	0	0	22
SS NN2208	Substation-1T-1100'WNW of 810	0	0	22

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Table A.1-2 No Future Use, Nonmanufacturing History

Structure Number	Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
SS NN2209	Substation-1T-1350'WNW of 810	0	0	22
SS NN2210	Substation-1T-1670'WNW of 810	0	0	22
SS NN2211	Substation-1T-2370'WNW of 810	0	0	22
SS NN2301	Substation-3T-200'N of 808	0	0	23
SS NN2501 T	Substation-1T-SE corner of 1602	0	0	25
SS NN2601	Substation-1T-S of 806	0	0	26
SS NN2701	Substation-3T-W of 810	0	0	27
Total: 103		1697	29654	

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Table A.1-3 No Future Use, Manufacturing History
Nonprocess History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0112A	$	Emergency Generator Plant	35	240	35
0112B		BBQ-N of 112	2	16	35
0114		Security Incinerator	8	34	35
0116		Bus Stop Shelter	4	140	01
0132	#$	Shell/MKE Fiedl Headquarters	0	0	35
0245		Substation Building	23	210	02
0282		Guard Station-fndtn-NW of NN0102	7	64	01
0286		Guard Station-SE of 557-foundation	6	64	01
0287		Guard Tower-foundation	6	64	01
0291		Guard Station-foundatn-735'W of 362	6	64	02
0295		Guard Tower-SE of 112-foundation	6	64	02
0296		Guard Tower-foundation	6	64	02
0307		Potable Water Valve & Meter Pit	11	130	36
0309		Maintainence/Storage-S of 545	10	420	01
0311	$	Sterns-Rogers Office/Sample Storage	350	4400	02
0315A	$	Steam Meter Pit-W of 315	7	100	01
0316		Plants Dispensary/Clinic	240	3200	01
0316		Wood Shed-W of 727	2	100	01
0317A		Pipe Shop/Grease Pit	48	2600	01
0321D	$	Fuel Oil Pumphouse	38	480	02
0322		Coal Sampling Building	30	340	02
0322A		Tractor Storage Shed	34	410	02
0323		Ash (Coal) Storage Silo-Hopper	350	500	02

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0324		Coal Hopper Structure	6	160	02
0325		Electrical Power Plant	3100	12000	02
0327		Cafeteria-foundation	29	1600	02
0328A		Toilet House	15	130	02
0334	$	Warehouse	980	11000	02
0337		Locker Room/Change House	57	590	02
0341		Change House	1000	12000	02
0341A	$	Condensate Pump House	15	160	02
0341B		Sewage Lift Station-covered pit	8	71	02
0342		Warehouse/M74 I. B. Storage	1000	13000	02
0343A		Flammable Materials Storehouse	29	240	02
0344		MFG Assembly/Warehouse	1200	11000	02
0345		Mfg Assembly/Storage/Warehouse	1000	11000	02
0346	$	Warehouse	920	11000	02
0351		Change House	920	9000	02
0354		Warehouse	1000	12000	02
0364		Sewage Lift Station-SE of 354	21	85	02
0392	$	Sewage Lift Station	46	260	34
0393	$	Sewage Lift Station	46	260	34
0394		West Gate Sewage Treatment Plant	3	140	33
0395		Toxic Yard Sewage Plant-NW of 867B	7	88	06
0409		Condensate Pump House	4	130	01
0432		Sand Blasting Pad/Change House-fdn	180	9200	01

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0459C		Small Building-N of 459	6	140	01
0464		Sample Building	2	55	01
0471C		TC Refrigeration	66	730	01
0474		Electrical Control House	16	80	01
0504A		DET Maintenance Shop/Storage	45	840	01
0516B	T	Misc Electrical Equipment Storage	34	210	01
0517		Offices/Change House/Laboratory	1300	18000	01
0520		Sample Pump/pH Probes Storehouse	1	36	01
0521C		Lunchroom/Field Foreman Office	41	640	01
0522B		Change House/Administration Bldg	420	5100	01
0525A		Refrig Compressor/Electrical Vault	31	440	01
0527	T	Change House/Quonset Hut	16	1000	01
0538A	T	Compressor Building	67	690	01
0539	T	Electrical Substation Builiding	17	430	01
0541A		Magazine	9	88	01
0543B	$	Facilities Engineers	590	8700	01
0546		Sewage Lift Station	12	72	01
0548		Water Pumping Station	370	2300	01
0549		Reservoir and Cooling Tower	630	4500	01
0550		Lift Station	6	280	01
0551	$+	Elevated Storage Tank	620	0	01
0552	$	Valve Pit	55	310	01
0553		Vault	8	64	01

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Table A.1-3 No Future Use, Manufacturing History
Nonprocess History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0555	T	Guardhouse/Gas Mask Training(TW-14)	5	210	01
0571A		Electrical Vault	21	85	01
0605		Flammable Materials Storehouse	2	170	03
0606		Flammable Materials Storehouse-fdn	1	170	03
0607		Flammable Materials Storehouse	2	210	03
0608		Flammable Materials Storehouse	2	210	03
0611		Data Processing Building	440	4600	04
0612		Courier Building	240	5100	04
0613		Management Information Systems	480	6500	04
0621A	$	Truck Scale Platform	56	740	04
0623		Carpenter Shop/Hobby Shop/Auto Shop	230	4200	04
0626		Machine and Welding Shop-foundation	100	6000	04
0629E		Service Station Shelter	35	25	04
0630	$	Gas Meter House	37	240	03
0639		Lumber Storage	94	4500	04
0641		Warehouse-foundation	95	900	03
0647B		Motor Pool Vehicle Storage	100	9600	04
0647C		Motor Pool Vehicle Storage	29	3000	04
0647D		Motor Pool Vehicle Storage	29	3000	04
0648		Road Oil Pump and Boiler House	56	350	04
0673	$	Railcar Scale House	2	88	03
0684		Guard Tower-E of 644, N of 675-fndn	6	64	03
0731		Reserve Center/Office/Change House	770	12000	01

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Nonprocess History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0733A		Magazine	34	400	01
0733B		Magazine	34	400	01
0733F		General Purpose Magazine	69	400	01
0745		Fire Fighting Manifolds for 745ABC	21	24	01
0752		Carpenter Shop/Storage	610	4900	01
0752A		Lumber Storage	110	1000	01
0754	T	Lumber Storage	49	840	01
0784		Guard Station-SE of 742-foundation	6	64	01
0801	T$	Radio Relay Station-N of 1726	12	180	25
0831	$	Technical Escort/Officer's Quarters	120	1100	35
0831A	$	Garage/Storage Shed	27	360	35
0833		Lumber Storage Shed	82	580	35
0840	#$	Air Monitoring Station	0	0	25
0841		CO Public Service Co Meter House	82	200	12
0853		Observation Pit/Mortar Range	94	2000	30
0854		Concrete Wall	12	200	26
0863		Target Range House	5	260	12
0864		General Storehouse	10	400	06
0865		Warehouse	41	1000	06
0866	$	Toxic Yard Office & Change House	140	2400	06
0867A		Toxic Yard Metal and Wood Shop	67	1600	06
0871A		Magazine	66	600	06
0871B		Magazine	66	600	06

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Table A.1-3 No Future Use, Manufacturing History
Nonprocess History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0871C		Magazine	66	600	06
0871D		Magazine	86	800	06
0872A		Magazine	86	800	06
0872B		Magazine	86	800	06
0872C		Magazine	86	800	06
0872D		Magazine	86	800	06
0873A		Magazine	86	800	06
0873B		Magazine	86	800	06
0873C		Magazine	86	800	06
0874B		Magazine	86	800	06
0874C		Magazine	86	800	06
0874D		Magazine	86	800	06
1504A	T	Monitoring Shed	7	220	25
1505A	T	Sentry Station	2	85	25
1510A	T	Fire Apparatus Buildng/Foam Storage	16	130	25
1512	T	Sentry Station/Gate House	18	130	25
1611A	T	Sentry Station	4	84	25
1619		Administration Building-N o'N Plant	8	320	25
1622		General Storehouse-N of North Plant	34	970	25
1705	T	Instruction Building/Cafeteria	250	4000	25
1706	T	Sentry Station/Gatehouse	44	360	25
1707	T	Cooling Tower	560	2800	25
1710	T$	Clinic and Administration Building	920	15000	25

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Table A.1-3 No Future Use, Manufacturing History
Nonprocess History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
1713	T$	Standby Generator Plant	100	2500	25
1719	T$	Electrical Distribution System	13	130	25
1728	T+	Potable Water Tank	69	0	25
1730		Guardhouse	13	110	31
1734		Change House	48	470	31
F 40007	T+	Horizontal Tank-TF2501	1	0	25
F 50117	T+	Vertical Tank-TF2501	7	0	25
F 50120	T+	Vertical Tank-TF2501	7	0	25
F 50123	T+	Vertical Tank-TF2501	7	0	25
F 50393	T+	Vertical Tank-TF2501	5	0	25
F 50394	T+	Vertical Tank-TF2501	3	0	25
F 50670	T+	Vertical Tank-TF2501	2	0	25
F 58987	T+	Horizontal Tank-TF2501	5	0	25
G 50830	T+	Vertical Tank-TF2501	1	0	25
G 50831	T+	Vertical Tank-TF2501	1	0	25
NN0101		Valve Gate-W side of Upper Derby	20	49	01
NN0102		Foundation-N of 534B	19	750	01
NN0103		Bathroom-N of 533	3	120	01
NN0104		Flare Tower-N of 571B, NW of 571	17	660	01
NN0105		Gas Meter House-SW of 508	5	200	01
NN0107		Metal Shed-W of 733B	1	310	01
NN0108		Metal Shed-W of 733C	1	310	01
NN0109		Guard Station-NE of 732	1	64	01

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
NN0110		Metal Shed-S of 521B	3	80	01
NN0111		Three Metal Incinerator-NW of 541	150	440	01
NN0112	T	Stack Observation Station-E of 527	12	280	01
NN0113		2 Metal Sheds-S of 474 SS	27	250	01
NN0114		Wooden Hut-SW of 461	2	22	01
NN0115		Flare Tower-N of Lime Pond	17	660	01
NN0116		Long Metal Shed-S of 544	47	6000	01
NN0117		2 Sheds-SW of 557	4	130	01
NN0201		Concrete Silo-NW of 254	350	1300	02
NN0202		Brick Structure-E of SS 361	15	140	02
NN0203		Fire Equipment Storage-SW of 254	29	80	02
NN0204		Coal Hopper foundation-N of 334	38	1100	02
NN0205		Brick Valve House-S of 321B	27	150	02
NN0301		Metal Shed-N of 618	1	410	03
NN0302		Metal Shed-N of 618	1	410	03
NN0303		Metal Shed-N of 619	1	2400	03
NN0304		Metal Shed-N of 619	1	1900	03
NN0601		Loading Dock-W of 866	150	11000	06
NN0602		Long Metal Shed-W of 865	1	3500	06
NN0603		Metal Shed-E of 867A	1	510	06
NN0902	$	Survey Tower-N of Post Office	1	140	09
NN1208		Brick Structure-900'SW of 846	9	81	12
NN1209		Concrete Bunker-1100'S of 846	14	68	12

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Table A.1-3 No Future Use, Manufacturing History
Nonprocess History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
NN1210		Concrete Bunker-1250'S of 846	10	56	12
NN1211		Concrete Bunker-1300'S of 846	14	68	12
NN1212		Concrete Bunker-1350'S of 846	6	64	12
NN1213		AMSA/OMS Maintenance Shop-N of 841	780	10000	12
NN2001		Antenna Installation-1/2 mi N o'9th	17	44	20
NN2002	$	Tank Pad-N of 9th, 2/3 mi E of F St	14	380	20
NN2301		Abandoned Water Purification Plant	60	1600	23
NN2402		Wooden Shed-N of Trickling Filters	7	170	24
NN2403		2 Trickling Filters-S of 391	1800	17000	24
NN2404		Imhoff Tank-S of 391	410	2800	24
NN2405		Antenna Installation-N of 836	12	44	24
NN2501		Shed-NW of 1618	8	300	25
NN2502		Gas Pump & Pad-NE of 1618	32	950	25
NN2503	T	Pumping Station-S of 1510	4	72	25
NN2601		Decon Pad/Tank-NE of Basin F	58	2300	26
NN2602		Valve gate-N end of Reservoir C	19	56	26
NN3001		Metal Shed-E of 853	1	580	30
NN3002		Metal Shed-E of 853	1	580	30
NN3101		Metal Shed-N of 1734	1	80	31
NN3102		3 Sets Shed Siding-1100'SE of 1735	2400	59000	31
NN3103		Storage Bldg-Toxic Storage Yard	1	1500	31
NN3104		Shack-W of Berms-Toxic Storage Yard	1	70	31
NN3105		Shed-NW End of Berms-Toxic Storg Yd	1	110	31

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Table A.1-3 No Future Use, Manufacturing History
Nonprocess History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
NN3106		Shed-NE End Berms-Toxic Storage Yd	2	4000	31
NN3107		Antenna Station-Toxic Storage Yard	4	32	31
NN3108		Shed-SW End of 1st Berm-Toxic Yard	1	110	31
NN3109		Shed-SE End of 1st Berm-Toxic Yard	2	4000	31
NN3501		3 Communications Antenna Pits	6	48	35
NN3601		Incinerator-500'NE of 834	30	350	36
NN3602		Incinerator-1000'SE of 834	6	100	36
NN3603		Metal Shed-NW of 725	4	140	36
NN3604		Metal Shed-SW of 725	6	200	36
NN3605		Metal Shed-SE of 725	2	200	36
NNT0101	+	Vertical Tank-TF0101	21	0	01
NNT0103	+	Vertical Tank-TF0106	1	0	01
NNT0105	+	Horizontal Tank-TF0108	1	0	01
NNT0106	+	Vertical Tank-TF0109	2	0	01
NNT0107	+	Horizontal Tank-E of 471C	1	0	01
NNT0108	+	Horizontal Tank-E of 314	1	0	01
NNT0110	+	Horizontal Tank-E of 536	1	0	01
NNT0111	+	Vertical Tank-TF0105	5	0	01
NNT0201	+	Undrground Oil Tank w/DCPD-W of 321	1	0	02
R 0019	+	Vertical Tank-TF0109-on fdn 426	1	0	01
R 0038	+	Vertical Tank-TF0106	4	0	01
SS 0112		Substation-1T-150'S of 112	0	0	02
SS 0213		Substation-3T-SE of 213	0	0	02

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Structure Number	Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
SS 0232	Substation-3T-SW of 254	0	0	02
SS 0243	Substation-1T-W of 243	0	0	02
SS 0245	Substation-3T-S of 245	0	0	02
SS 0311	Substation-1T-S of 311	0	0	02
SS 0312	Substation-1T-S of 312	0	0	01
SS 0313	Substation-3T-W of 313	0	0	01
SS 0313-2	Substation-3T-W of 313	0	0	01
SS 0315	Substation-3T-SW of 315	0	0	01
SS 0316	Substation-1T-S of 316	0	0	01
SS 0316A	Substation-3T-S of 316A	0	0	01
SS 0317	Substation-1T-NW of 433	0	0	01
SS 0321A	Substation-3T-SW of 242	0	0	02
SS 0321B	Substation-1T-SE of 242	0	0	02
SS 0325	Substation-14T-between 325 & 311	0	0	02
SS 0327	Substation-3T-W of 332	0	0	02
SS 0328	Substation-3T-N of 328	0	0	02
SS 0330	Substation-1T-SW of 337	0	0	02
SS 0335	Substation-3T-S of 336	0	0	02
SS 0342	Substation-3T-ENE of 342	0	0	02
SS 0344	Substation-5T-E of 344	0	0	02
SS 0355	Substation-3T-E of 356	0	0	02
SS 0365	Substation-3T-N of 365	0	0	02
SS 0368	Substation-1T-1/4 mi SSE of 351	0	0	01

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Structure Number	Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
SS 0371	Substation-10T-N of 371	0	0	02
SS 0371A	Substation-1T-S of 372	0	0	02
SS 0371B	Substation-1T-N of SS 371	0	0	02
SS 0383	Substation-3T-E of 383	0	0	02
SS 0411	Substation-3T-NE of 411	0	0	01
SS 0422	Substation-3T-W of 422	0	0	01
SS 0451	Substation-1T-SE of 413	0	0	01
SS 0461	Substation-2T-S of 459	0	0	01
SS 0464	Substation-2T-SE of 464	0	0	01
SS 0510	Substation-3T-SE of 510	0	0	01
SS 0512	Substation-3T-NW of 517	0	0	01
SS 0514	Substation-3T-200'E of 561	0	0	01
SS 0516	Substation-3T-W of 519	0	0	01
SS 0517	Substation-2T-NW of 517	0	0	01
SS 0517A	Substation-3T-N of 512	0	0	01
SS 0517B	Substation-3T-SW corner of 517	0	0	01
SS 0521	Substation-3T-SW of 521	0	0	01
SS 0523	Substation-3T-S of 803	0	0	26
SS 0525A	Substation-1T-SW of 525	0	0	01
SS 0527	Substation-1T-S of 527	0	0	01
SS 0531	Substation-1T-W of 531	0	0	01
SS 0534	Substation-3T-200'N of 534A	0	0	01
SS 0539	Substation-2T-SE of 537	0	0	01

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Structure Number	Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
SS 0541	Substation-3T-W of 541	0	0	01
SS 0543	Substation-5T-W of 543	0	0	01
SS 0548	Substation-1T-N of 548	0	0	01
SS 0548A	Substation-1T-101'W of 548	0	0	01
SS 0556	Substation-1T-N of 541	0	0	01
SS 0575	Substation-1T-N of 504	0	0	01
SS 0575A	Substation-1T-N of 505	0	0	01
SS 0726	Substation-3T-200'S of 725	0	0	36
SS 0728	Substation-3T-E of 728	0	0	01
SS 0729	Substation-6T-E of 729	0	0	01
SS 0732	Substation-6T-S of 732	0	0	01
SS 0742	Substation-6T-N of 742	0	0	01
SS 0747	Substation-1T-75'S of 729	0	0	01
SS 0756	Substation-1T-W of 868C	0	0	01
SS 0757	Substation-1T-S of 463D	0	0	01
SS 0780	Substation-1T-N of T 1505	0	0	01
SS 0781	Substation-1T-NE of T 1507	0	0	01
SS 0806D	Substation-1T-SE of 806	0	0	26
SS 0806G	Substation-1T-0.25 mi SW of 9 & D	0	0	26
SS 1402 T	Substation-3T-150'W of 1601/1701	0	0	25
SS 1403 T	Substation-3T-S of 1701	0	0	25
SS 1404 T	Substation-3T-130'S of 1501	0	0	25
SS 1501 T	Substation-7T-SE of 1501	0	0	25

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Table A.1-3 No Future Use, Manufacturing History
Nonprocess History Subgroup

Structure Number	Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
SS 1505 T	Substation-3T-E of 1505	0	0	25
SS 1506 T	Substation-2T-NW corner of 1506	0	0	25
SS 1510 T	Substation-2T-150'W of 1601	0	0	25
SS 1601-1 T	Substation-1T-E of 1601	0	0	25
SS 1601-2 T	Substation-1T-E of 1601	0	0	25
SS 1602 T	Substation-2T-100'SE of 1606	0	0	25
SS 1603 T	Substation-3T-100'NE of 1602	0	0	25
SS 1605 T	Substation-1T-between 1605 & 1608	0	0	25
SS 1606-1 T	Substation-3T-100'E of 1606	0	0	25
SS 1606-2 T	Substation-1T-100'NE of 1606	0	0	25
SS 1607 T	Substation-3T-100'E of 1607	0	0	25
SS 1609 T	Substation-1T-150'NE of 1609	0	0	25
SS 1611 T	Substation-1T-E of 1611	0	0	25
SS 1611AB T	Substation-2T-S of 1611	0	0	25
SS 1614 T	Substation-2T-NE o'1615	0	0	25
SS 1616 T	Substation-2T-NE of 1616	0	0	25
SS 1701 T	Substation-3T-100'E of 1701	0	0	25
SS 1702 T	Substation-2T-W of 1702	0	0	25
SS 1703 T	Substation-1T-S of 1703	0	0	25
SS 1704-1 T	Substation-3T-E of 1704	0	0	25
SS 1704-2 T	Substation-2T-E of 1704	0	0	25
SS 1704-3 T	Substation-3T-E of 1704	0	0	25
SS 1706 T	Substation-1T-N of 1706	0	0	25

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Structure Number	Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
SS 1707 T	Substation-1T-S of 1704	0	0	25
SS 1710 T	Substation-3T-100'E of 1710	0	0	25
SS 1711 T	Substation-3T-100'E of 1706	0	0	25
SS 1724 T	Substation-3T-200'N of 1706	0	0	25
SS 6C	Substation-1T-SW corner of section	0	0	02
SS 7C	Substation-1T-112'ESE 7th & C	0	0	02
SS AWL021	Substation-1T-S of pool rd	0	0	02
SS CPR 1	Rectifier-1R-130'SSE of 254	0	0	02
SS CPR 10	Rectifier-1R-S of 742A	0	0	01
SS CPR 2	Rectifier-1R-W of 313	0	0	01
SS CPR 3	Rectifier-1R-146'W of 326	0	0	02
SS CPR 4	Rectifier-1R-E of 352A	0	0	02
SS CPR 5	Rectifier-1R-with SS 514	0	0	01
SS CPR 7	Rectifier-1R-NE of SS 411	0	0	01
SS CPR 8	Rectifier-1R-W of 433	0	0	01
SS CPR 9	Rectifier-1R-W of 542	0	0	01
SS GA	Substation-1T-0.1 mi N of 732	0	0	36
SS LDLA	Substation-1T-W of Lower Derby	0	0	01
SS SBA	Substation-3T-SE side of 834	0	0	36
SS SWIM	Substation-1T-W of pool/on C	0	0	02
T 0026 +	Horizontal Tank-TF0107	1	0	01
T 0032 +	Horizontal Tank-TF0109-on fdn 426	1	0	01
T 0064 +	Horizontal Tank-TF0107	1	0	01

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
T 0066	+	Vertical Tank-TF0103	38	0	01
T 0075	+	Vertical Tank-TF0103	1	0	01
T 0076	+	Vertical Tank-TF0103	1	0	01
T 0077	+	Vertical Tank-TF0103	1	0	01
T 0078	+	Vertical Tank-TF0103	1	0	01
T 0079	+	Vertical Tank-TF0103	1	0	01
T 0080	+	Vertical Tank-TF0103	1	0	01
T 0081	+	Vertical Tank-TF0103	2	0	01
T 0082	+	Vertical Tank-TF0103	2	0	01
T 0130	+	Horizontal Tank-TF0109	1	0	01
T 0131	+	Horizontal Tank-TF0109	1	0	01
T 0132	+	Horizontal Tank-TF0109	1	0	01
T 0133	+	Horizontal Tank-TF0109	1	0	01
T 0139	+	Horizontal Tank-TF0107	1	0	01
T 0190	+	Horizontal Tank-TF0107	3	0	01
T 0208	+	Vertical Tank-TF0109	6	0	01
T 0273	+	Horizontal Tank-TF0109	9	0	01
T 0289	+	Air Receiver/Surge Tank-NE of 516	1	0	01
T 1040	+	Vertical Tank-TF0107	1	0	01
T 1048	+	Vertical Tank-TF0109	1	0	01
T 1124	+	Vertical Tank-TF0103	1	0	01
T 1127	+	Vertical Tank-TF0110	7	0	01
T 1134	+	Vertical Tank-TF0110	3	0	01

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
T 1142	+	Horizontal Tank-TF0109	2	0	01
T 1171	+	Horizontal Tank-TF0110	1	0	01
T 1173	+	Horizontal Tank-TF0110	1	0	01
T 1215	+	Vertical Tank-TF0110	3	0	01
T 1272	+	Vertical Tank-TF0103	15	0	01
T 1290	+	Vertical Tank-TF0108	4	0	01
T 1305	+	Water Surge Tank-TF0108	4	0	01
T 1307	+	Vertical Tank-TF0108	2	0	01
T 1327	+	Vertical Tank-TF0103	17	0	01
T 1392	+	Vertical Tank-E of 512	5	0	01
T 1446	+	Horizontal Tank-TF0103	1	0	01
T 1463	+	Vertical Tank-TF0104	2	0	01
T 1507	+	Quench Water Tank-TF0105	86	0	01
T 1508	+	Qench Water Tank-TF0105	81	0	01
T 1570	+	Vertical Tank-TF0105	5	0	01
T 1606	+	Horizontal Tank-TF0109	5	0	01
T 1973	+	Vertical Tank-TF0103	2	0	01
TF0101	+	Planavin Tank Farm-N of 534B	200	0	01
TF0102	+	515 Tank Farm-E of 534	200	0	01
TF0103	+	BCH Tank Farm-W of 514D	120	0	01
TF0104	+	514 Tank Farm-N of 509	370	0	01
TF0105	+	DET System Tank Farm-N of 728	790	0	01
TF0106	+	Tank Farm-NE of 515	57	0	01

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Table A.1-3 No Future Use, Manufacturing History
Nonprocess History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
TF0107	+	Tank Farm-W & S of 514A	110	0	01
TF0108	+	Tank Farm-N of & btwn 525 & 521	200	0	01
TF0109	+	Tank Farm-surrounding 471	360	0	01
TF0110	+	471 Tank Farm-S of 472A	200	0	01
TF2501	T+	Tank Farm-W of 1704	25	0	25
TW-13	T	Open Storage-foundation-N of 1611	120	5800	25
V 1064	+	Vertical Tank-TF0109	1	0	01
V 1147	+	Horizontal Tank-TF0103	1	0	01
V 1214	+	Vertical Tank-TF0106	2	0	01
V 1230	+	Horizontal Tank-TF0102	1	0	01
V 1250	+	Horizontal Tank-TF0104	1	0	01
V 1253	+	Horizontal Tank-TF0104	1	0	01
V 1254A	+	Methyl Chloride Tank-TF0104	1	0	01
V 1254B	+	Horizontal Tank-TF0104	1	0	01
V 1259	+	DET Wastewater Storage Tank-TF0105	11	0	01
V 1265	+	Horizontal Tank-TF0105	91	0	01
V 1270	+	Horizontal Tank-TF0105	1	0	01
V 1313	+	Horizontal Tank-TF0105	30	0	01
Z-28	#$		0	0	23
Z-3	#$		0	0	35
Z-36	#$		0	0	01
Z-38	#$		0	0	04
Z-39	#$		0	0	04

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Table A.1-3 No Future Use, Manufacturing History
Nonprocess History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
Z-40	#$		0	0	25
Z-41	#$		0	0	25
Z-42	#$		0	0	25
Z-56	#$		0	0	35
Z-57	#$		0	0	35
Z-58	#$		0	0	35
Z-68	#$		0	0	35
Z-69	#$		0	0	35
Z-70	#$		0	0	04
Total:	423		34868	438020	

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Table A.1-4 No Future Use, Manufacturing History
Process History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0130	#$		0	0	35
0213		Calibration Facility/X Ray Lab	680	4600	02
0241		Administration/Lab/Change House	290	3000	02
0242		Chlorine Production/US Mint Storage	3100	42000	02
0243		Chlorine Production Compressor Bldg	1000	9200	02
0244		3 Liquid Chlorine Tank Saddles	30	200	02
0246		HCl Production Facility	56	1600	02
0247		Salt Storage Building & foundation	1100	58000	02
0248		Brine Treatment Plant-foundation	180	4200	02
0249		Brine Storage & Pump House-foundatn	260	9300	02
0251		Chlorine Evaporator/Storage	1100	23000	02
0252		Cell Liquor Storage-foundation	29	2900	02
0253		50% NaOH Storage-foundation	36	4500	02
0254		Caustic Fusion Plant/Drum Storage	1200	16000	02
0255		Fuel Oil Pump Station & 2 tank pads	23	300	02
0256		Fuel Oil Tank-SE corner of 254	6	65	02
0313A		Sewage Pump Station	3	38	01
0314		Fixed Laundry Service Building	770	8600	01
0316A		Morrison-Knudsen/Change House	340	5100	01
0317		Vehicle Maintenance/Storage/Offices	450	11000	01
0318	#$		0	0	35
0321	$	Boiler Plant-Central Gas Heat Plant	6000	56000	02
0321A	$+	Tank	4	0	02

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0321B	+	Fuel Oil Tank-SE of 321C	4	0	02
0321C	$	Pumphouse	37	580	02
0321E	+	Fuel Oil Storage Tank	12	0	02
0326		Power Plant Pumphouse & Spray Pond	720	15000	02
0328		Goop Mixing and Filling Building	2300	16000	02
0329		Gasoline Pump Building	46	400	02
0331	$	Phosgene Filling Warehouse	1000	12000	02
0332	$	Warehouse	1000	12000	02
0333	$	Warehouse	980	11000	02
0335	$	Warehouse	990	11000	02
0336	$	General Purpose Warehouse	990	11000	02
0338		Storage Magazine	12	54	02
0339		Storage Magazine	14	54	02
0340		Magazine	14	54	02
0343		Manuf. Bldg.-PreClustering Warehous	1000	11000	02
0347	$	Warehouse/Chemical Storage	1900	27000	02
0352		Open Storage-foundation	250	12000	02
0352A		Quonset Storage	19	970	02
0353		Open Storage-foundation	760	13000	02
0355		Warehouse	1000	13000	02
0356		Warehouse	1000	13000	02
0365		Explosive Blending Building	490	3200	02
0369	$	Lower Derby Valve Gate	20	49	01

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Table A.1-4 No Future Use, Manufacturing History
Process History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0374		Water Treatmnt Plt-W o'Lr Derby-fdn	110	`890	02
0378	$	Chlorinating Station (on airport)	16	150	10
0379	$	Chlorinating Station	20	210	03
0381	#$		0	0	02
0382		Chlorinating Station	7	56	03
0385	$	Water Pump Station	14	140	04
0386	$	Water Pump Station	14	140	04
0387	$	Water Pump Station	14	140	04
0391		Sewage Disposal & Treatment Plant	88	1100	24
0411		SM & SD Manufacturing/Storage	1500	16000	01
0411A		Steam Meter House	6	72	01
0411B		Steam Meter House	4	64	01
0413		WP Storage/SM Storage	670	5500	01
0413A	+	Phossy Water Tank-W of 413	120	0	01
0415		Caustic Makeup Tank-foundation	79	290	01
0424A		Mustard Scrubber-foundation	10	720	01
0424C		Aldrin Filter Building-foundation	16	750	01
0433		Ethylene Generator/R&D Office	2900	29000	01
0434	+	West Gas Holder	730	0	01
0435	+	East Gas Holder	720	0	01
0451		Warehouse/Production Filling	900	11000	01
0459		Acetylene Generator Building	229	3200	01
0459A		Lime Slurry Pumphouse	24	81	01

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0459B		Lime Slurry Pumphouse	36	170	01
0461		Tank Farm Pumphouse	51	430	01
0462A	+	Fuel Oil Storage Tank	1700	0	01
0463A	+	Storage Tank	1000	0	01
0463B	+	Storage Tank	1000	0	01
0463C	+	DCPD/Alcohol Storage Tank	920	0	01
0463F	+	Storage Tank	1000	0	01
0463G	+	Storage Tank	1000	0	01
0463H	+	Storage Tank	1000	0	01
0464A	+	Storage Tank	11000	0	01
0464B	+	Storage Tank	11000	0	01
0471		TC Reactor/Pesticide Production	580	5100	01
0471B		Electrical Vault	9	160	01
0472		TC Refrigeration	110	1200	01
0472A		Lunchroom/Maintainence Equipmt Stor	24	320	01
0473		TC Drum Loading/Pesticide Packaging	86	1900	01
0475		Railroad Car Warmer Shed	180	980	01
0502		West Chemical Metering Pump	41	700	01
0503		East Chemical Metering Pump	37	290	01
0504		DET Emergency Diesel Generator	31	330	01
0505		DET Pretreatment Feed Pump House	30	510	01
0506		DET Control House	68	830	01
0507		DET Separator Pumphouse	41	520	01

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0508		DET Copper Sulfate Treatment	160	4700	01
0509		DET Methyl Cl Compressor/Liquifier	69	430	01
0510		Methyl Isocyanate Refrigeration	28	300	01
0511		Chlorinated Paraffin Mfg./Storage	2500	23000	01
0511A		Chlorinated Paraffin/Change House	160	1700	01
0512A	T	Flammable Solvent Storage Shed	7	250	01
0514C		Pump House	1	96	01
0514D		Refrigeration Compressor	13	200	01
0514E		Monomethylamine Dilution Control	4	92	01
0515		CP/DDT/Pesticide Production	1600	15000	01
0515A		Nudrin/Endrin Storage	202	1900	01
0518A	$	Emergency Fire Protection Generator	22	290	01
0519		Hydrogen Peroxide Storage	82	290	01
0519A		Hydrogen Peroxide Pumphouse	4	160	01
0521		Acetylene Compressor/Pesticide Mfg.	220	1100	01
0521A		Refrigeration/DCPD Cracking	36	320	01
0521B		Compressor House/Maintainence	93	670	01
0522		WP Cup Filling/Acetylene Mfg	890	9400	01
0522A	+	Phossy Water Tank	17	112	01
0523		AT Mfg. Bldg./Igniter Tube Filling	300	4000	01
0523A		WP Storage Tank House	140	1500	01
0523C		Arsenic Trioxide Dry Storage Silo	71	210	01
0523D		Arsenic Trioxide Dry Storage Silo	96	360	01

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0523E		Arsenic Trioxide Dry Storage Silo	96	360	01
0523F		Arsenic Trioxide Dry Storage Silo	96	360	01
0523G		Arsenic Trioxide Dry Storage Silo	96	360	01
0524		WP Filling Building-fndatn	27	1400	01
0525		Product Dvlpmt Lab/Nudrin Mfg.	380	8100	01
0526		Pesticide Filter-foundation	26	900	01
0529	T	NaOH Make Up/Azodrin Support Struct	87	750	01
0531		Warehouse	970	11000	01
0532		Pesticide Storage/Warehouse	1100	12000	01
0533		Flammable Materials Storehouse	19	130	01
0534		Pumphouse/Storage	330	930	01
0534A		Drum Storage/Field Shop/Office	250	2700	01
0534B		Planavin Manufacture	470	13000	01
0534C		Emergency Generator/Electric Vault	27	210	01
0534D		Emergency Generator	46	440	01
0542		Drummed Product Storage/Gen.Storage	1000	11000	01
0543	$	Maintainence Shops/Instrument Lab	2000	25000	01
0543A	$	Steam Meter Pit	12	93	01
0544		Heavy Equipment Maintenance Shop	180	3300	01
0545		Paint Shop	22	800	01
0556	+	Hazardous Waste Tank	69	0	01
0557		Salvage Yard Storage/Maintenance	51	1000	01
0561		BCH Unit Control House	170	1600	01

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Process History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0561A		Acetylene Compressor-foundation	400	5000	01
0571		Vent Gas Burner	140	520	01
0571B		Tank Room/HCCPD Drum Storage	130	2600	01
0614		Warehouse	920	11000	03
0615		Warehouse	920	11000	03
0616		Warehouse	910	11000	03
0617		Warehouse	920	11000	03
0621	$	Property Disposal/Salvage Ofice	890	19000	04
0622		Paint Shop/General Storage	160	1700	04
0624	$	Repair/Salvage/Surplus Facility	850	24000	04
0625	$	Warehouse	870	11000	04
0626C		Heavy Equipment Shop-foundation	10	580	04
0627	$	Vehicle Maintenance Shop	620	16000	04
0627B		Flammable Materials Storehouse	5	240	04
0628A	+	Diesel Fuel/Waste Oil Storage Tank	1	0	04
0629		Service Station	44	290	04
0629A	+	Diesel Oil/Gasoline Storage Tank	1	0	04
0629B	+	Diesel Oil/Gasoline Storage Tank	1	0	04
0629C	+	Diesel Oil/Gasoline Storage Tank	1	0	04
0629D	+	Diesel Oil Storage Tank	1	0	04
0631	$	Railcar Maintainence/Roundhouse	350	4500	04
0631A		Flammable Materials Storehouse	5	240	04
0632	$	Gas-Fired Heating Plant	420	1400	04

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Table A.1-4 No Future Use, Manufacturing History
Process History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0633		Cafeteria/Bug Lab/Movie Theatre	130	2500	04
0633A		Laboratory/Storehouse	56	680	04
0633B	$	Hazardous Materials Storage	140	640	04
0634	$	Flammable Materials Storehouse	58	400	04
0643		Flammable Materials Storehouse	55	400	03
0646		Rodent Control Building-foundation	5	840	04
0648A	+	Road Oil Tank	41	0	04
0648B	+	Road Oil Tank	46	0	04
0670	#$		0	0	03
0679		Warehouse/Can Scouring-foundation	62	780	10
0724		Incinerator/Electostatic Preciptatr	460	2600	01
0727	$	Facilities Maintenance	98	3600	01
0729	$	General Purpose Warehouse	1600	23000	01
0732		Army Reserve Warehouse/M19 Bomb Rew	3900	47000	01
0733C		Magazine	34	400	01
0733D		Magazine	58	400	01
0733E		General Purpose Magazine	65	400	01
0735		Foamite/Oil Product Storage	37	440	01
0741	T	Refrigeration Building	880	6300	01
0743		RMA Laboratory/Change House/Office	360	5400	01
0743A		Chemical Sewer Lift Station	4	36	01
0744		Gasoline/Benzol Pumphouse	78	760	01
0745A	+	DCPD/Diesel/Benzol/Gasoline Tank	21	0	01

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0745B	+	Gasoline/Benzol/DCPD/Diesel Tank	21	0	01
0745C	+	Gasoline Storage Tank	39	0	01
0746		Gasoline Unloading Rack	2	1	01
0748		Flammable Materials Storehouse	49	400	01
0751		Paint and Process Shop	640	5500	01
0753	T	Steam Fitter Maintenance/Storage	52	1000	01
0765	#$	Potable Water Purificaton	0	0	01
0787	$	Warehouse	480	9600	06
0793	$	Drum Storage Warehouse	470	9600	31
0794	$	Drum Storage Warehouse	520	9600	31
0795	$	Drum Storage Warehouse	480	9600	31
0797	$	Drum Storage Warehouse	480	9600	31
0808	$	No Bdry Groundwater Treatment Plant	650	3900	23
0809	$	Irondale Groundwater Treatment Sys.	320	3000	33
0810	$	NW Bndry Groundwater Treatment Bldg	490	3100	27
0815	+#$	Basin F Liquid Tank	0	0	26
0816	+#$	Basin F Liquid Tank	0	0	26
0817	+#$	Basin F Liquid Tank	0	0	26
0825	#$	Basin A Neck Treatment Bldg.	0	0	35
0834		Incinerator	120	3800	36
0867B		Flammable Materials Storehouse	13	190	06
0874A		Magazine	86	800	06
0884		Igloo Storage	210	1600	06

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Table A.1-4 No Future Use, Manufacturing History
Process History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
1402	T+	8 Dichloro Tanks & Unloading Dock	200	0	25
1403	T+	2-HF Storage Tanks & Unloading Dock	83	0	25
1404	T+	Carbon Tetrachloride Storage Tank	83	0	25
1405	T+	Hydorchloride Acid Storage Tanks	83	0	25
1502	T+	Unloading Dock-Isopropanol Storage	83	0	25
1505	T+	Caustic Tank Farm	6	0	25
1507	T+	Methanol Storage Tank	83	0	25
1508	T+	TBA Storage Tank	84	0	25
1509	T	Isopropanol Dehydration Unit	76	400	25
1510	T+	Fuel Oil Tank	1200	0	25
1618		General Storehouse-N of North Plant	36	1000	25
1701	T$	Warehouse	2300	26000	25
1704	T	Compressed Air Plant	1400	9100	25
1711	T$	Gas Meter House	6	170	25
1712	T	Gas Heating Plant	320	2300	25
1715	T#$		0	0	25
1717	T$	Chlorinating Station	11	120	25
1718	T$	Valve Pit & Chlorinating Station	24	260	25
1726	T+	Elevated Process Water Tank	270	0	25
41104	T+	Dichloro Tank-TF 1402	1	0	25
41115	T+	Dichloro Tank-TF 1402	1	0	25
49368	T+	Dichloro Tank-TF 1402	1	0	25
49369	T+	Dichloro Tank-TF 1402	1	0	25

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Table A.1-4 No Future Use, Manufacturing History
Process History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
49370	T+	Dichloro Tank-TF 1402	1	0	25
49371	T+	Dichloro Tank-TF 1402	1	0	25
49372	T+	Dichloro Tank-TF 1402	1	0	25
49373	T+	Dichloro Tank-TF 1402	1	0	25
F 50097	T+	Caustic Blending Tank-TF 1505	21	0	25
F 50098	T+	Caustic Blending Tank-TF 1505	21	0	25
F 50099	T+	Caustic Blending Tank-TF 1505	21	0	25
F 5102	T+	Caustic Blending Tank-TF 1505	21	0	25
F 5103	T+	Caustic Blending Tank-TF 1505	21	0	25
F 5104	T+	Caustic Blending Tank-TF 1505	21	0	25
F 5105	T+	Caustic Blending Tank-TF 1505	21	0	25
F 5106	T+	Caustic Blending Tank-TF 1505	21	0	25
F 5107	T+	Caustic Blending Tank-TF 1505	21	0	25
F 5108	T+	Caustic Blending Tank-TF 1505	21	0	25
NN0106		Fertil & Waste Loadng Fac-N of 728	78	99	01
NN0300	#$		0	0	03
NN22		36 GW Wells-NW Boundary Treatment	0	0	22
NN23		36 GW Wells-N Boundary Treatment	0	0	23
NN24		56 GW Wells-N Boundary Treatment	0	0	24
NN28		2 GW Wells-Irondale Treatment	0	0	28
NN33		45 GW Wells-Irondale Treatment	0	0	33
PR01	+	Pipe Runs in Section 1	2000	0	01
PR02	+	Pipe Runs in Section 2	520	0	02

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Table A.1-4 No Future Use, Manufacturing History
Process History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
PR04	+	Pipe Runs in Section 4	100	0	04
PR25	T+	Pipe Runs in Section 25	820	0	25
PR36	+	Pipe Runs in Section 36	470	0	36
SQI-1	#$	SQI Facility	0	0	26
SQI-2	#$	SQI Facility	0	0	26
SQI-3	#$	SQI Facility	0	0	26
SQI-4	#$	SQI Facility	0	0	26
SQI-5	#$	SQI Facility	0	0	26
SQI-6	#$	SQI Facility	0	0	26
SQI-7	#$	SQI Facility	0	0	26
SQI-8	#$	SQI Facility	0	0	26
SQI-9	#$	SQI Facility	0	0	26
SS 0312A		Substation-1T-NE of 312	0	0	36
SS 0314		Substation-3T-NW of 314	0	0	01
SS 0321		Substation-6T-S of 321	0	0	02
SS 0361		Primary Substation-68T-SE of 112	0	0	02
SS 0362		Substation-3T-N of 362	0	0	02
SS 0363		Substation-3T-N of 362	0	0	02
SS 0474		Substation-7T-W of 472	0	0	01
SS 0515		Substation-6T-NW of 515	0	0	01
SS 0528		Substation-1T-S of 529	0	0	01
SS 0529		Substation-3T-S of 540	0	0	01
SS 0571		Substation-3T-75'W of 504A	0	0	01

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
SS 0725		Substation-3T-S of SS 726	0	0	36
SS 0727		Substation-1T-W side of 727	0	0	01
SS 0755		Substation-3T-S of 868C	0	0	01
SS 0782		Substation-1T-N of 732	0	0	01
SS 7215		Substation-1T-fenced railcar area	0	0	36
SS CPR 6		Rectifier-1R-with SS 515	0	0	01
SS F182		Substation-1T-500'W of T 1512	0	0	36
SS H-1		Substation-2T-SE of 319	0	0	01
SS PSCOST		Substation-1T-1/8 mi S of 7th on C	0	0	02
SS PT56/57		Substation-2T-NE of 510	0	0	01
SS WR		Substation-1T-600'NE of 732	0	0	36
T 0014	+	Acetone Tank-TF0102	1	0	01
T 0015	+	Hexane Tank-TF0102	1	0	01
T 0019	+	MBA Storage Tank-TF0104	1	0	01
T 0058	+	Horizontal Tank-TF0106	1	0	01
T 0065	+	Caustic Soda Storage Tank-TF0103	31	0	01
T 0160	+	Chlorinated Paraffin Tank-TF0102	3	0	01
T 0161	+	Acetone Tank-TF0102	4	0	01
T 0164	+	Chlorinated Paraffin Tank-TF0102	1	0	01
T 0165	+	Aqueous Urea Tank-TF0102	1	0	01
T 0257	+	Vertical Tank-TF0106	1	0	01
T 1010	+	Hexane Tank-TF0102	1	0	01
T 1027	+	Mother Liqour Storage Tank-TF0106	1	0	01

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Table A.1-4 No Future Use, Manufacturing History
Process History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
T 1128	+	Methanol Tank-TF0104	1	0	01
T 1129	+	MMAA Tank-TF0104	1	0	01
T 1132	+	Trimethylphosphite (TMP) Tank-TF010	1	0	01
T 1133	+	MMA Tank-TF0104	1	0	01
T 1135	+	Sulfuryl Chloride Tank-TF0104	1	0	01
T 1139	+	Sulfuryl Chloride Tank-TF0104	1	0	01
T 1140	+	Chloroform Tank-TF0104	1	0	01
T 1146	+	Dicetene Tank-TF0110	2	0	01
T 1147	+	Dicetene Tank-TF0110	2	0	01
T 1148	+	Diketene Storage Tank-TF0104	1	0	01
T 1149	+	Diketene Tank-TF0104	1	0	01
T 1150	+	Monomethylamine Tank-TF0104	1	0	01
T 1151	+	Monomethylamine Tank-TF0104	1	0	01
T 1168	+	Brine Storage Tank-SE corner 528	5	0	01
T 1178	+	Acetone Storage Tank-TF0103	1	0	01
T 1202	+	Chlorine Tank-TF0103	1	0	01
T 1203	+	Ammonia Storage Tank-TF0103	2	0	01
T 1204	+	Urea Storage Tank-TF0103	3	0	01
T 1216	+	Mother Liquor/Dinitro Tank-TF0102	6	0	01
T 1219	+	Mixed Acid Tank-TF0101	22	0	01
T 1220	+	Mixed Acid Tank-TF0101	22	0	01
T 1222	+	MMA Blending Tank-TF0104	1	0	01
T 1235	+	Glycol Storage Tank-TF0108	1	0	01

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Table A.1-4 No Future Use, Manufacturing History
Process History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
T 1246	+	Diketene Tank-TF0104	1	0	01
T 1247	+	Diketene Tank-TF0104	1	0	01
T 1253	+	Acetaldoxime Storage Tank-TF0108	1	0	01
T 1267	+	Caustic Tank-TF0101	1	0	01
T 1273	+	Vertical Tank-TF0103	16	0	01
T 1279	+	Methylene Chloride Tank-TF0108	1	0	01
T 1288	+	Methyl Mercaptan Surge Tank-TF0108	1	0	01
T 1289	+	Dibrom/MIBK Storage Tank-TF0108	1	0	01
T 1291	+	Acetaldoxime Dilution Tank-TF0108	5	0	01
T 1296	+	Spent Acid Tank-TF0101	22	0	01
T 1307	+	Spent Acid Tank-TF0101	17	0	01
T 1322	+	Sulfuryl Chloride Tank-TF0104	2	0	01
T 1323	+	Sulfuryl Chloride Tank-TF0104	2	0	01
T 1324	+	Brine Storage Tank-TF0103	1	0	01
T 1340	+	Crystal, Acetone Tank-TF0102	16	0	01
T 1390	+	Vertical Tank-E of 512	5	0	01
T 1391	+	Vertical Tank-E of 512	5	0	01
T 1433	+	Caustic Storage Tank-TF0108	11	0	01
T 1500	+	Caustic Tank-TF0105	21	0	01
T 1501	+	Separator Tank-TF0105	130	0	01
T 1502	+	Vertical Tank-TF0105	25	0	01
T 1503	+	Vertical Tank-TF0105	15	0	01
T 1504	+	Vertical Tank-TF0105	15	0	01

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Table A.1-4 No Future Use, Manufacturing History
Process History Subgroup

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
T 1505	+	Caustic Tank-TF0105	240	0	01
T 1506	+	Surge Tank-TF0105	240	0	01
T 1509	+	Cuprous Sulfide Storage Tank-TF0105	490	0	01
T 1510	+	DET Effluent Storage Tank-TF0105	110	0	01
T 1511	+	Fuel Oil Storage Tank-TF0105	47	0	01
T 1512	$+	Incinerator Feed Stor Tank-N of 7th	120	0	36
T 1513	$+	Incinerator Feed Stor Tank-N of 7th	120	0	36
T 1514	+	Atmospheric Storage Tank-TF0105	8	0	01
T 1515	+	Atmospheric Storage Tank-TF0105	17	0	01
T 1516	+	Cuprous Sulfide Settler Tank-TF0105	36	0	01
T 1566	+$	Liquid Fertilizer Tank-N of 7th	450	0	36
V 1001	+	Vinyl Chloride Tank-W of 512	1	0	01
V 1002	+	Vinyl Chloride Tank-W of 512	2	0	01
V 1156	+	Horizontal Tank-TF0106	6	0	01
V 1186	+	Methyl Mercaptan Relief Tank-TF0108	1	0	01
V 1187	+	MIC Relief Knockout Vessel-TF0106	1	0	01
V 1220	+	Vertical Tank-TF0106	6	0	01
V 1255	+	DET Effluent Suction Vessel-TF0105	10	0	01
V 1264	+	Horizontal Tank-TF0105	1	0	01
V 1267	+	Surge Vessel-TF0105	2	0	01
Total:	365		119371	1024806	

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Table A.1-5 No Future Use, Agent History

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0313		Laboratory	1000	10000	01
0315		Warehouse-Laundry	1000	10000	01
0319		Magazine/Flammable Material Storage	52	400	01
0412	T	Mustard Filling, Manuf., and Storag	1600	12000	01
0414		Mustard Scrubber Unit-foundation	79	310	01
0416		H/Dichlor Disposal Reactor-foundatn	79	300	01
0417		H/Dichlor Decon Pit-foundation	79	280	01
0422	*	H Manufacture/Aldrin Production	2100	23000	01
0426	*	Mustard Disposal Reactor-foundation	59	1600	01
0427		Decontamination Pit-fdn	4	80	01
0428		Incinerator	6	56	01
0429		H Brine Mixing/Pesticide Mfg.	15	560	01
0431		Ethylene Dryer/Comprssr/Refrigeratn	660	6300	01
0512	T	Filling/Pesticide Production	610	3800	01
0514	T*	Lewisite/HD/Pesticide Production	3200	27000	01
0514A	T	L/M-1 Storage/Dowtherm Boiler	110	1700	01
0516	T	Lewisite Distillation/Pest. Prod.	1400	13000	01
0528	T	HD Burning/Pesticide Manufacture	380	2200	01
0536	T*	Ammo.Dem.Facility/Crude MustardSto.	990	4100	01
0537	T*	Thaw House	2300	16000	01
0538	T*	Ton Container Reconditioning Plant	1200	15000	01
0540	T	Ton Container Renovation Plant	330	4900	01
0541		Warehouse/WP Filling	770	11000	01
0725		Bomb Testing Station	99	460	36

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0726		Bomb Test Building	40	430	36
0728	$	HD Filling/Pesticide Storage/Wareh.	1400	21000	01
0742	T$	Warehouse	4800	49000	01
0742A	T*	Tank House	330	1300	01
0785		Warehouse	1400	29000	06
0786	$	Warehouse	480	9600	06
0788	$	Warehouse	480	9600	06
0791	$	Warehouse	480	9600	31
0792	$	Drum Storage Warehouse	440	9600	31
0796	$	Warehouse	480	9600	31
0798	$	Drum Storage Warehouse	480	9600	31
0881	$	Igloo Storage	210	1600	06
0882	$	Igloo Storage	210	1600	06
0883		Igloo Storage	210	1600	06
0885	$	Igloo Storage	210	1600	06
0886	$	Igloo Storage	210	1600	06
1501	T*	GB Manufacturing/Demil. Building	9000	81000	25
1503A	T*	Scrubber Facility-1503A/B/C=1503	440	580	25
1503B	T*	Scrubber Facility-1503=1503A/B/C	88	580	25
1503C	T*	Scrubber Facility-1503=1503A/B/C	79	580	25
1504	T	200-ft Steel Stack	630	710	25
1506	T*	GB Storage	1900	9000	25
1601	T*	GB Filling	7700	69000	25
1601A	T*	Ammunitions Demilitarization Facil.	670	2800	25

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Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
1602	T*	Paint Storage	620	2200	25
1603A	T*	Scrubber Facility	89	580	25
1603B	T*	Scrubber System-1603=1603A/B	89	580	25
1605	T	Munitions Storage Igloo	150	1000	25
1606	T*	Cluster Assembly Buildinge	14000	60000	25
1607	T$	Warehouse	1700	26000	25
1608	T	Munitions Storage Igloo	150	1000	25
1609	T	Munitions Storage Igloo	150	1000	25
1610	T	Munitions Storage Igloo	150	1000	25
1611	T	Demilitarization Facility	3100	32000	25
1613	T	Explosive Unpacking Building	77	750	25
1614	T	Warehouse	260	7800	25
1615	T	Warehouse	170	4000	25
1616	T	Warehouse	85	4000	25
1702	T	Weld Shop	49	2400	25
1703	T	Spray Dryer Facility	2700	28000	25
1727	T	Industrial Waste Sewer	36	700	25
1735		Loading Dock	670	11000	31
T 0027	+	Vertical Tank-TF0107	1	0	01
Total:	67		74735	678636	

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* - Indicates Structure with Agent Contaminated Tanks or Process Equipment
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Table A.1-6 Structures Removed Since 1986

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0131		NCO Family Quarters	56	840	35
0134		Family Housing	87	1200	35
0141		West Gate Security Police Building	130	6300	04
0149		Administration	110	5100	04
0151		B.O.Q. Barracks	190	8200	34
0154		Bachelor Officers Quarters-foundatn	51	8200	34
0155		Barracks & Classrooms-fdn-N of 151	52	8200	34
0157		Men's Barracks-foundation-S of 159	54	8200	34
0158		NCO Service Club-fnd-SW of 159	36	8200	34
0159		Mens Barracks	190	8200	34
0162		NCO Apts-fdn-SW of 166	37	4100	34
0163		Bowling Alley	140	2700	34
0164		Officer's Apts-foundation-W of 166	63	8200	34
0165		Troop Supply Building-E of 166	46	1300	34
0166		Vault Storage Building	110	1100	34
0167		Hobby Shop/Recreation	58	620	34
0463D	@+	Waste Storage Tank(US-4)	220	0	01
0463E		Storage Tank	1000	0	01
0755	@	Change House/Storage	41	480	01
0756	@	Blender/Scrubber Metering House	140	84	01
0757	@+	UDMH Storage Tank Farm	490	0	01
0758A	@	Fire Protection Valve Pit	11	91	01
0759	@	Drum Cleaning	32	800	01
0760	@	Drum Storage Facility	9	200	01
0761	@	Drum Loading Station	10	150	01

+ - Indicates Tanks, Tank Farms, Pipe Runs
@ - Hydrazine Facility
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Table A.1-6 Structures Removed Since 1986

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0805	@+	Storage Tank	79	0	01
0846		Recreation Building	100	8800	12
0868C	@	Office/Ton Container Storage Shed	24	290	01
CS-1	@+	Hydrazine Storage	67	0	01
HAS-1	@+	Hydrazine or Aerozine Tank	67	0	01
HAS-2	@+	Hydrazine or Aerozine Tank	67	0	01
HAS-3	@+	Hydrazine or Aerozine Tank	67	0	01
NN0901		Con.Struc-1300'SE of 6th & A St	8	96	09
NN1201		Long Metal Shed-25'W of 846	4	850	12
NN1202		Square Metal Shed-W of 846	5	410	12
NN1203		Wooden Shed-W of 846	5	200	12
NN1204		Wooden Frame/fdn-S of 846	4	100	12
NN1205		Wooden Shed-S of 846	3	85	12
NN1206		Shooting Bunker-S of 846	6	76	12
NN1207		Shooting Bunker #2-S of 846	14	76	12
US 1	@+	UDMH Storage	110	0	01
US 2	@+	UDMH Storage	110	0	01
Total:	42		4103	93448	

\+ - Indicates Tanks, Tank Farms, Pipe Runs
@ - Hydrazine Facility
rev 06/21/93

Table A.1-7 Remediatioin Use Structure

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0112A	$	Emergency Generator Plant	35	240	35
0130	#$		0	0	35
0132	#$	Shell/MKE Field Headquarters	0	0	35
0211	$	Gas Meter House	21	240	02
0311	$	Sterns-Rogers Office/Sample Storage	350	4400	02
0315A	$	Steam Meter Pit-W of 315	7	100	01
0318	#$		0	0	35
0321	$	Boiler Plant-Central Gas Heat Plant	6000	56000	02
0321A	$+	Tank	4	0	02
0321C	$	Pumphouse	37	580	02
0321D	$	Fuel Oil Pumphouse	38	480	02
0331	$	Phosgene Filling Warehouse	1000	12000	02
0332	$	Warehouse	1000	12000	02
0333	$	Warehouse	980	11000	02
0334	$	Warehouse	980	11000	02
0335	$	Warehouse	990	11000	02
0336	$	General Purpose Warehouse	990	11000	02
0341A	$	Condensate Pump House	15	160	02
0346	$	Warehouse	920	11000	02
0347	$	Warehouse/Chemical Storage	1900	27000	02
0361	$	Primary Electrical Substation	54	380	02
0362	$	Warehouse	4000	59000	02
0369	$	Lower Derby Valve Gate	20	49	01
0370	#$		0	0	02

$ - Remediation Use Structure
# - Structure Added Since 1986, Not Part of Task 24(EBASCO, 1988)
T - Indicates Treaty Structure
rev 06/21/93

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0371	$	Water Pumping Station	820	1800	02
0372A	$	Chlorinator Station	56	380	02
0378	$	Chlorinating Station (on airport)	16	150	10
0379	$	Chlorinating Station	20	210	03
0381	#$		0	0	02
0385	$	Water Pump Station	14	140	04
0386	$	Water Pump Station	14	140	04
0387	$	Water Pump Station	14	140	04
0392	$	Sewage Lift Station	46	260	34
0393	$	Sewage Lift Station	46	260	34
0518A	$	Emergency Fire Protection Generator	22	290	01
0543	$	Maintainence Shops/Instrument Lab	2000	25000	01
0543A	$	Steam Meter Pit	12	93	01
0543B	$	Facilities Engineers	590	8700	01
0551	$+	Elevated Storage Tank	620	0	01
0552	$	Valve Pit	55	310	01
0618	$	Warehouse	5300	110000	03
0619	$	Warehouse	5200	110000	03
0621	$	Property Disposal/Salvage Ofice	890	19000	04
0621A	$	Truck Scale Platform	56	740	04
0624	$	Repair/Salvage/Surplus Facility	850	24000	04
0625	$	Warehouse	870	11000	04
0627	$	Vehicle Maintenance Shop	620	16000	04
0630	$	Gas Meter House	37	240	03

$ - Remediation Use Structure
\# - Structure Added Since 1986, Not Part of Task 24(EBASCO, 1988)
T - Indicates Treaty Structure
rev 06/21/93

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0631	$	Railcar Maintainence/Roundhouse	350	4500	04
0632	$	Gas-Fired Heating Plant	420	1400	04
0633B	$	Hazardous Materials Storage	140	640	04
0634	$	Flammable Materials Storehouse	58	400	04
0670	#$		0	0	03
0673	$	Railcar Scale House	2	88	03
0727	$	Facilities Maintenance	98	3600	01
0728	$	HD Filling/Pesticide Storage/Wareh.	1400	21000	01
0729	$	General Purpose Warehouse	1600	23000	01
0742	$	Warehouse	4800	49000	01
0765	#$		0	0	01
0786	$	Warehouse	480	9600	06
0787	$	Warehouse	480	9600	06
0788	$	Warehouse	480	9600	06
0791	$	Warehouse	480	9600	31
0792	$	Drum Storage Warehouse	440	9600	31
0793	$	Drum Storage Warehouse	470	9600	31
0794	$	Drum Storage Warehouse	520	9600	31
0795	$	Drum Storage Warehouse	480	9600	31
0796	$	Warehouse	480	9600	31
0797	$	Drum Storage Warehouse	480	9600	31
0798	$	Drum Storage Warehouse	480	9600	31
0801	T$	Radio Relay Station-N of 1726	12	180	25
0808	$	No Bdry Groundwater Treatment Plant	650	3900	23

$ - Remediation Use Structure
# - Structure Added Since 1986, Not Part of Task 24(EBASCO, 1988)
T - Indicates Treaty Structure
rev 06/21/93

Table A.1-7 Remediatioin Use Structure

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
0809	$	Irondale Groundwater Treatment Sys.	320	3000	33
0810	$	NW Bndry Groundwater Treatment Bldg	490	3100	27
0815	#$		0	0	26
0816	#$		0	0	26
0817	#$		0	0	26
0825	#$		0	0	35
0831	$	Technical Escort/Officer's Quarters	120	1100	35
0831A	$	Garage/Storage Shed	27	360	35
0840	#$		0	0	25
0866	$	Toxic Yard Office & Change House	140	2400	06
0881	$	Igloo Storage	210	1600	06
0882	$	Igloo Storage	210	1600	06
0885	$	Igloo Storage	210	1600	06
0886	$	Igloo Storage	210	1600	06
1607	T$	Warehouse	1700	26000	25
1701	T$	Warehouse	2300	26000	25
1710	T$	Clinic and Administration Building	920	15000	25
1711	T$	Gas Meter House	6	170	25
1713	T$	Standby Generator Plant	100	2500	25
1715	T#$		0	0	25
1717	T$	Chlorinating Station	11	120	25
1718	T$	Valve Pit & Chlorinating Station	24	260	25
1719	T$	Electrical Distribution System	13	130	25
NN0300	#$		0	0	03

$ - Remediation Use Structure
# - Structure Added Since 1986, Not Part of Task 24(EBASCO, 1988)
T - Indicates Treaty Structure
rev 06/21/93

Table A.1-7 Remediatioin Use Structure

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
NN0902	$	Survey Tower-N of Post Office	1	140	09
NN2002	$	Tank Pad-N of 9th, 2/3 mi E of F St	14	380	20
NNT2601	$+	3 Tanks for Basin F Liquid Holding	0	0	26
SQI-1	#$	SQI Facility	0	0	26
SQI-2	#$	SQI Facility	0	0	26
SQI-3	#$	SQI Facility	0	0	26
SQI-4	#$	SQI Facility	0	0	26
SQI-5	#$	SQI Facility	0	0	26
SQI-6	#$	SQI Facility	0	0	26
SQI-7	#$	SQI Facility	0	0	26
SQI-8	#$	SQI Facility	0	0	26
SQI-9	#$	SQI Facility	0	0	26
T 1512	$+	Incinerator Feed Stor Tank-N of 7th	120	0	36
T 1513	$+	Incinerator Feed Stor Tank-N of 7th	120	0	36
T 1566	+$	Liquid Fertilizer Tank-N of 7th	450	0	36
Z-28	#$		0	0	23
Z-3	#$		0	0	35
Z-36	#$		0	0	01
Z-38	#$		0	0	04
Z-39	#$		0	0	04
Z-40	#$		0	0	25
Z-41	#$		0	0	25
Z-42	#$		0	0	25
Z-56	#$		0	0	35

$ - Remediation Use Structure
# - Structure Added Since 1986, Not Part of Task 24(EBASCO, 1988)
T - Indicates Treaty Structure
rev 06/21/93

Table A.1-7 Remediatioin Use Structure

Structure Number		Description of Structure	Bank Volume (Cubic Yards)	Size Sq Ft	Section
Z-57	#$		0	0	35
Z-58	#$		0	0	35
Z-68	#$		0	0	35
Z-69	#$		0	0	35
Z-70	#$		0	0	04
Total:	125		60025	856850	

$ - Remediation Use Structure
# - Structure Added Since 1986, Not Part of Task 24(EBASCO, 1988)
T - Indicates Treaty Structure
rev 06/21/93

Appendix B
Estimates of Structural Material Volumes

TABLE OF CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

DAA	Detailed Analysis of Alternatives
FS	Feasibility Study
FT	Feet
RMA	Rocky Mountain Arsenal
Cu ft	Cubic Foot
Cu yd	Cubic Yard
SF	Square Feet

B1.0 INTRODUCTION

This appendix describes the contents of the Task 24 Database and the material quantity calculations for the Structures Feasibility Study (FS), which were used to develop cost estimates for alternatives developed in the Structures Detailed Analysis of Alternatives (DAA). The Task 24 Database was originally developed during the Structures Survey at Rocky Mountain Arsenal (RMA) (EBASCO 1988/RIC88306R02) to provide general information on structure volumes and areas as well as roof and wall types. During the DAA, however, more specific information was needed on volumes and areas and structural debris quantities to accurately evaluate remedial alternatives. The Structures FS quantity calculations were therefore developed. This set of algorithms manipulates information contained in certain fields of the Task 24 Database to arrive at quantity values (e.g., total structure footprint, wall volume in cubic yards, salvage volume of structural materials) that were used to evaluate the cost of an alternative.

B2.0 TASK 24 DATABASE FIELDS

The Task 24 Database presents field survey data for all structures at RMA. The surveys were conducted in 1987, and included estimates of structure material types and volumes. The database consists of 86 fields, 12 of which were used to calculate material quantities for the structures DAA. The 12 fields of interest include the following:

BUILDING = structure number
S_BLDG_VOL = standing structure volume
C_BLDG_VOL = collapsed structure volume, neatly stacked
FDN_AB_GRD = foundation above ground surface
FDN_BL_GRD = foundation below ground surface
C_EQUIPVOL = collapsed structure volume, neatly stacked
PIPING_VOL = collapsed piping volume, neatly stacked
SQ_FT = total square feet of structure floor space
STORIES = number of stories in a structure
ROOF_TYPE = type of roofing materials for a structure
WALL_TYPE = type of wall materials for a structure
FOUND_TYPE = type of foundation materials for a structure

The following sections describe these fields in further detail.

B2.1 TOTAL NUMBER OF STRUCTURES (BUILDING)

This field provides the structure number. Structures were grouped according to Structures FS medium groups. The total number of structures within a medium group is the sum of the records in the building field.

B2.2 TOTAL STANDING VOLUME (S_BLDG_VOL)

This field provides the total standing volume for each structure. The sum of all these values is the total standing volume of structures in the medium group.

B2.3 TOTAL COLLAPSED VOLUME (C_BLDG_VOL)

This field provides the collapsed and neatly stacked volume of all structural materials within the structure. Structural material is made up of foundations, interior and exterior walls, floors, ceilings, and roofs. It does not include process equipment or piping. The sum of these values is the total collapsed volume of structural material in the medium group. Two exceptions should be noted about the values in this field:

1. The collapsed structure volume is zero, but a volume is given for foundation materials. In this case, C_BLDG_VOL was calculated as follows:

   C_BLDG_VOL = FDN_AB_GRD + FDN_BL_GRD

   where:

   FDN_AB_GRD = volume of foundation material above ground surface
   FDN_BL_GRD = volume of foundation materials below ground surface

2. The collapsed structure volume is less than the volume for structural materials. In this case, C_BLDG_VOL was increased by the volume of FDN_AB_GRD and FDN_BL_GRD, as follows:

   C_BLDG_VOL(adjusted) = FDN_AB_GRD + FDN_BL_GRD + C_BLDG_VOL

B2.4 TOTAL COLLAPSED VOLUME OF PROCESS EQUIPMENT (C_EQUIPVOL)

This field provides the collapsed and neatly stacked volume of all process equipment contained in the structure. The sum of these values is the total collapsed volume of process equipment in the medium group.

B2.5 TOTAL COLLAPSED VOLUME OF PIPING (PIPING_VOL)

This field provides the collapsed and neatly stacked volume of all piping contained in each structure. The sum of these values is the total collapsed volume of piping in the medium group.

B2.6 SQ_FT

This field provides the total square feet of floor space for the structure. The sum of these values is the total square footage of the medium group.

B2.7 STORIES

This field indicates the number of stories in a structure.

B2.8 ROOF_TYPE

This field categorizes the type of roofing material used. The options for this field include the following:

CA = corrugated asbestos
CM = corrugated metal
C = concrete
A = asphalt shingle
B = built-up/hot tar
N = none
W = wood
WA = wood and asphalt
M = sheet metal
FG = fiberglass

B2.9 WALL_TYPE

This field categorizes the type of wall material used. For the purposes of the FS, it was assumed that the floors are made of the same material as the walls. The options for this field include the following:

FG = fiberglass
C = concrete
W = wood
T = tile
B = brick
M = masonry/cinder block
CM = corrugated metal
CA = corrugated asbestos
A = asbestos board
N = none

B2.10 FOUND_TYPE

This field categorizes the type of foundation material. The options for this field include the following:

C = concrete
W = wood
N = none

B3.0 STRUCTURES FS QUANTITY CALCULATIONS

The Structures FS quantity calculation algorithms made use of data in certain fields of the Task 24 Database to develop more specific values on area, volume, and structural debris for use in the DAA. The calculated values include the following:

TSF = total structure footprint
CAP_AREA = area of cap
PERIMETER = perimeter of structure
CYDROOF = volume of roof material
CYDWALL = volume of wall and floor material
CONCRETE = volume of concrete
WOOD = volume of wood
TILE = volume of structural tile
BRICK = volume of brick
MASONRY/CINDER BLOCK = volume of masonry or cinder block
CORRUGATED METAL = volume of corrugated metal

CORRUGATED ASBESTOS = volume of corrugated asbestos
ASBESTOS BOARD = volume of asbestos board
FIBERGLASS = volume of fiberglass
ASPHALT SHINGLE = volume of asphalt shingle
BUILT-UP/HOT TAR = volume of built-up or hot tar roofing
SHEET METAL = volume of sheet metal
WOOD AND ASPHALT = volume of wood and asphalt, considered roofing
SCRAP METAL = volume of scrap metal, which is the sum of metals listed above, plus rebar
TSA_SB_VD = treatable surface area for sand blasting or vacuum dusting
TSA_SC = treatable surface area for steam cleaning
ISA = interior surface area of structure
EISA = exterior and interior surface area of structure

B3.1 TOTAL STRUCTURE FOOTPRINT (TSF)

The SQ_FT and STORIES fields were used to determine TSF. SQ_FT provided the total square feet of floor space for the structure, and STORIES provided the number of stories. For buildings with STORIES ≥#2, TSF was calculated as:

TSF = (SQ_FT)/(STORIES)

For structures with STORIES = 0 or 1, TSF was calculated as:

TSF = (SQ_FT)

B3.2 CAPPING AREA (CAP_AREA)

CAP_AREA is the area required for the clay cap alternative. Two caps are planned exclusively for structural materials from the Process and Non-Process Subgroups. The first cap covers consolidated structure debris from the Railyard Area and the vicinity, referred to here as the Railyard Region. The Railyard Region consists of all process and non-process structures from Sections 3, 4, 9, 10, 28, 33, and 34. The second cap covers consolidated structure debris from North Plants and the vicinity, here called the North Plants Region. The North Plants Region consists of all process and non process structures from Sections 20, 22, 23, 24, 25, 26, 27, and 30. The remaining process and non-process structures from Sections 1, 2, 6, 12, 31, 35, and 36 are consolidated as grade fill in the central processing area in South Plants, and capped as part of soils treatment alternatives.

The two caps were assumed to be square, and the consolidated debris was assumed to be placed at an average depth of 2.5 feet A 7.5-ft fringe was added to all sides of the cap to extend beyond the debris. The cap area was calculated as follows:

1) Debris area = (Debris Volume)x(27)/(2.5)

Where:

Debris Volume = volume of structure debris from the process and non-process groups within the consolidation region

27 = cubic feet/cubic yards (cu ft/cu yd)

2.5 = average debris depth in ft

2) Length of Side = $(\text{Debris Area})^{1/2} + 15$

Where:

Length of Side = length of individual cap side in ft

15 = total fringe length required per side in ft

3) Individual Cap Area = $(\text{Length of side})^2$

Where:

Individual Cap Area = area of the cap for a given consolidation region in square feet (SF)

4) Total Cap Area = Railyard Region Cap + North Plants Region Cap

Where:

Total Cap Area = total area of cap required for this alternative in SF

Because the caps include debris from two subgroups, costs needed to be distributed. Cost were distributed by calculating the fraction of the total debris volume that comes from the process and non-process structures as follows:

Process Fraction = (process debris from the Railyard Region and North Plants Region)/(process and non-process debris from the Railyard Region and North Plants Regions)

Process Cap Area = (Process Fraction) x (Total Cap Area)

Non-process Fraction = (non-process debris from the Railyard Region and North Plants Region)/(process and non process debris from the Railyard Region and North Plants Region)

Non-process Cap Area = (Non-process Fraction) x (Total Cap Area)

B3.3 TOTAL STRUCTURE FOOTPRINT PERIMETER (PERIMETER)

TSF was used to determine PERIMETER. This calculation involved performing two steps. Using a representative sample of length and width dimensions of individual structures (derived from the Task 24 Structure Survey report), the ratio of a structure perimeter to the original footprint area was first determined for several structures. These ratios were then plotted and extrapolated to determine factors that could be used to calculate PERIMETER. Listed below are the representative square footage amounts and the resulting factors:

TSF	Factor
0-200	0.250
201-300	0.227
301-400	0.200
401-500	0.172
501-600	0.158
601-700	0.144
701-800	0.130
801-900	0.120
901-1000	0.112
1001-2000	0.0925
TSF	Factor

2001-3000	0.0767
3001-4000	0.0663
4001-5000	0.0610
5001-6000	0.0558
6001-7000	0.0529
7001-8000	0.0494
8001-9000	0.0461
9001-10,000	0.0435
10,001-20,000	0.0350
20,001-30,000	0.0308
30,001-40,000	0.0275
40,001-50,000	0.0250
50,001-60,000	0.0229

PERIMETER was calculated as follows:

$$\text{PERIMETER} = (\text{TSF}) \times (\text{Factor})$$

PERIMETER is not presented in the material volume tables.

Perimeter values for alternatives involving fencing were calculated using PERIMETER. It was assumed that the buffer zone surrounding the structure to be fenced is 10 ft on each side and that the structure itself is rectangular, which adds 80 ft to the total structure perimeter. The calculation is as follows:

$$\text{fence perimeter} = (\text{PERIMETER}) + (80)$$

B3.4 ROOF VOLUME IN CUBIC YARDS (CYDROOF)

The Task 24 Database does not present roof volume separately, so a roof material quantity algorithm was developed. It assumed that a roof is 1/10 ft thick, and that it is the same area as the building footprint. Several conditions were added to the algorithm to account for situations where the roof volume is negligible. The volume was calculated as follows:

$$\begin{gathered}\text{CYDROOF} = (\text{TSF}) \text{ x } (0.1)/27, \\ [\text{if C\_BLDG\_VOL} = (\text{FDN\_AB\_GRD} + \text{FDN\_BL\_GRD}), \\ \text{then CYDROOF} = 0 \text{ and CYDWALL} = 0], \\ [\text{if } 0.75 \text{ x C\_BLDG\_VOL} \leq (\text{FDN\_AB\_GRD} + \text{FDN\_BL\_GRD}) < \text{C\_BLDG\_VOL, then} \\ \text{CYDROOF} = 0 \text{ and CYDWALL} = \text{C\_BLDG\_VOL} - (\text{FDN\_AB\_GRD} + \text{FDN\_BL\_GRD})]\end{gathered}$$

where:

TSF = total structure footprint (SF)
0.1 = thickness of roof (ft)
27 = # cu ft/cu yd

ROOF_TYPE is not presented in the material volume tables.

B3.5 WALL VOLUME IN CUBIC YARDS (CYDWALL)

The Task 24 Database does not present wall volume separately, so a wall and floor material quantity algorithm was developed. It was assumed that the wall and floor volume and the roof volume together add up to the bank cubic yards of structure material. The wall and floor volume was calculated as follows:

CYDWALL = (C_BLDG_VOL) - (FDN_AB_GRD) - (FDN_BL_GRD) - (CYDROOF),
[unless C_BLDG_VOL = 0, then use (CYDWALL = 0)]

where:

C_BLDG_VOL = bank building volume from Task 24 Database
CYDROOF = roof volume calculated above
FDN_AB_GRD = foundation volume aboveground surface from Task 24 Database
FDN_BL_GRD = foundation volume belowground surface from Task 24 Database

WALL_TYPE is not presented in the material volume tables.

B3.6 TOTAL COLLAPSED VOLUME AND SALVAGE VOLUME OF STRUCTURAL MATERIALS

The quantities of roof, wall, and foundation material types were summed together to create total collapsed material volumes. For example, the total concrete volume for a structures medium group is the sum of all the roof, wall, and foundation concrete quantities for that medium group. The calculation in this case is as follows:

CONCRETE = CYDROOF (as concrete) + CYDWALL (as concrete) + FDN_AB_GRD (as concrete) + FDN_BL_GRD (as concrete)

The salvage volume of scrap metal applies only to manufacturing structures, and is based on the following assumptions:

- Process equipment, process piping, and tanks will be demolished and treated as part of the IRA efforts. It is assumed that 80 percent of the total volume of these items will be available as scrap metal.
- The scrap metal from the non-process structure group will be available for salvage. It is assumed that 80 percent of the total volume of scrap metal will be available. The algorithm used to calculate this volume is as follows:

$$\text{Salvage volume of scrap metal} = 0.5 \times [\text{corrugated metal} + \text{sheet metal} + 0.03 \times (\text{concrete volume})]$$

B3.7 TREATABLE SURFACE AREA, IN SITU SAND BLASTING AND VACUUM DUSTING (TSA_SB_VD)

TSA_SB_VD was calculated using the following data from the following fields: TSF, STORIES, PERIMETER, CYDWALL, FDN_AB_GRD and FDN_BL_GRD. It was assumed that the treatments are applied to walls and floors and foundations, so separate calculations were created for these two physical groups. TSA_SB_VD is the sum of the two calculations described below.

The treatable surface area for walls and floors was applied to CYDWALL for concrete, tile, brick, and masonry. It was assumed that the treatment is applied to 30 percent of the interior surface area and to a maximum of 5 ft up the interior walls. The calculation is as follows:

$$\begin{gathered}\text{Treatable surface area, walls and floors} = \\ 0.3 \times [\text{TSF} \times \text{STORIES, unless STORIES} = 0\text{, then use TSF}] + \\ 0.3 \times [(\text{PERIMETER}) \times 5\text{, unless STORIES} = 0\text{, then use } 0] + \\ 0.3 \times [0.15 \times 5 \times \text{PERIMETER, unless STORIES} = 0\text{, then use } 0]\end{gathered}$$

The treatable surface area for foundations was applied to FDN_AB_GRD and FDN_BL_GRD for concrete material types. The calculation is as follows:

$$\text{Treatable surface area, foundations} = 0.3 \times \text{TSF}$$

B3.8 TREATABLE SURFACE AREA, IN SITU STEAM CLEANING (TSA_SC)

TSA_SC was calculated using data from the following fields: TSF, STORIES, and PERIMETER.

The calculations are similar to those performed for in situ sand blasting and vacuum dusting (Section B3.10). The treatment is applied to the walls and floors and foundations, so separate calculations were created for these two physical groups.

The treatable surface area for walls and floors was applied to CYWALL for concrete, tile, and masonry. It was assumed that the treatment is be applied to 30 percent of the interior surface area and to a maximum of 5 feet up the interior walls. The calculation is as follows:

Treatable surface area, walls and floors =

0.3 x [TSF x STORIES, unless STORIES = 0, then use TSF] +

0.3 x [(PERIMETER) x 5, unless STORIES = 0, then use 0] +

0.3 x [0.15 x 5 x PERIMETER, unless STORIES = 0, then use 0]

The treatable surface area for foundations was applied to FDN_AB_GRD and FDN_BL_GRD for concrete material types. The calculation is as follows:

Treatable surface area, foundations = 0.3 x TSF

B3.9 INTERIOR SURFACE AREA (ISA)

ISA was calculated based on the STORIES field from the Task 24 Database and from the calculated value for PERIMETER described in Section B3.3. It was assumed that the wall height is 15 feet.

The calculation is as follows:

ISA =
[2 × (STORIES) × (TSF), unless STORIES = 0, then use (TSF)] +
[(Perimeter) × 15, unless STORIES = 0, then use 0] +
[0.15 × 15 × (Perimeter), unless STORIES = 0, then use 0]

The first term of the formula accounts for the floors and ceilings, the second term accounts for walls, and the third term accounts for interior partitions, which was assumed to be 15 percent of the perimeter area.

B3.10 EXTERIOR AND INTERIOR SURFACE AREA (EISA)

EISA was calculated based on the STORIES field from the Task 24 Database, and from the calculated value for PERIMETER described in Section B3.3. The calculation is as follows:

EISA =
[2 × (STORIES) × (TSF), unless STORIES = 0, then use (TSF)] +
[(Perimeter) × 15, unless STORIES = 0, then use 0] +
[0.15 × 15 × (Perimeter), unless STORIES = 0, then use 0] +
[(TSF), unless (STORIES) = 0, then use 0] +
[(Perimeter) × 15, unless (STORIES) = 0, then use 0]

The first term of the formula accounts for the floors and ceilings, the second term accounts for walls, the third term accounts for interior partitions, the fourth term accounts for the roof, and the fifth term accounts for the exterior wall area.

B4.0 REFERENCES

RIC 88306R02
Ebasco Services Incorporated (EBASCO). 1988. Task 24 Structures Survey Final Report.

EPA - OERR. 1988, October. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final. EPA/540/G-89/004. OSWER Directive 9355.3-01.

Appendix C

Costs

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LIST OF ACRONYMS AND ABBREVIATIONS

CY	cubic yard
DAA	Detailed Analysis of Alternatives
DSA	Development and Screening of Alternatives
EPA	U.S. Environmental Protection Agency
GRA	General Response Action
LF	linear foot
O&M	Operations and Maintenance
PPE	personal protective equipment
RMA	Rocky Mountain Arsenal
SF	square foot
UXO	unexploded ordnance

C1.0 INTRODUCTION

This appendix contains the cost estimates for the alternatives retained from the Development and Screening of Alternatives (DSA) for structures at Rocky Mountain Arsenal (RMA). A total of 28 cost estimates were developed for the structures medium: 1 cost estimate each for the Future Use, No Potential Exposure and No Future Use, Nonmanufacturing History Medium Groups (Tables C-1 and C-2, respectively); 12 cost estimates for the No Future Use, Manufacturing History–Process History Subgroup (Tables C-3 through C-14); 6 cost estimates for the No Future Use, Manufacturing History–Non-Process History Subgroup (Tables C-15 through C-20); and 8 cost estimates for the No Future Use, Agent History Medium Group (Tables C-21 through C-28).

The following sections explain the format of the cost estimate tables and discuss the methodology used to develop the unit rates and indirect cost factors.

C2.0 COST ESTIMATE TABLES

The detailed cost estimates for the structures DAA are presented in Tables C-1 through C-8 of this appendix. They are organized in terms of three main groups, capital costs, operations and maintenance (O&M) costs, and long-term activities costs. Both capital and O&M costs may include both prime contracts and subcontracts direct costs, and associated indirect costs. Long-term costs may include prime contractor direct costs and associated indirect costs. If a cost did not apply to a given alternative, it was not included in the estimate. Under this organization, an individual cost table may contain up to ten subsections, including:

- Direct Capital Costs
- Indirect Capital Costs
- Direct Subcontract Capital Costs
- Indirect Subcontract Capital Costs
- Direct O&M Costs (Operations)
- Indirect O&M Costs (Operations)
- Direct Subcontract O&M Costs (Operations)
- Indirect Subcontract O&M Costs (Operations)
- Direct O&M Costs (Long-Term Activities)
- Indirect O&M Costs (Long-Term Activities)

Direct costs are those required to accomplish activities in the field. Direct capital costs are those incurred to prepare for remediation of structures, such as the construction of a landfill or incineration facility. Direct subcontract capital costs are costs incurred by specialty subcontractor for the construction of major treatment facilities such as an incineration facility. Direct O&M costs (Operations) are those costs incurred to actually remediate structures, such as demolition and placement of debris in a landfill. Direct subcontract O&M costs are operation costs incurred by these specialty subcontractors during treatment. O&M (Long-Term Activities) are those costs incurred for monitoring and/or routine maintenance after remediation is accomplished. An example of long-term O&M is monitoring and maintenance of a landfill.

Indirect costs are explained in Section C4.0. The elements of indirect costs may include:

- Mobilization/Demobilization
- Indirects, Overhead, and Profits; or Contractor Markup
- Engineering Design
- Resident Engineering
- Contingency

It should be noted, these estimates are structured solely to represent a comparative cost between site-wide alternatives and not as stand alone estimates. Caution should be exercised in comparing individual alternative costs such as engineering design; resident engineering; indirects, overhead, and profits since these costs represent only a comparative percentage of any individual alternative. Prior to implementation of the preferred alternatives developed in this document it will be necessary to re-evaluate the total estimated cost to provide a more detailed cost assessment.

The headings across the top of each cost estimate table are explained as follows:

<u>Cost Item:</u>

Each horizontal line represents a unit operation and its associated direct cost. The cost item begins with a prefix designating which exceedance category the unit rate is addressing, e.g., agent, biota, human health, and/or unexploded ordnance (UXO).

Cost Type:

There are two cost types indicated in this column: lump sum (LS) and annual (A). "LS" denotes a unit operation that occurs in only 1 year, while the "A" denotes the annual cost for a unit operation that occurs in more than 1 year.

Start Year:

This column denotes the starting year for the unit operation. Cardinal numbers are used to specify the calendar year, with year 1 representing 1995.

End Year:

This column denotes the ending year for the unit operation. Note that no ending year is specified for the lump sum cost type. Ordinal numbers are used to specify the calendar year with year 1 representing 1995.

1992 ($) Unit Cost:

This column denotes the unit cost for the particular unit operation in 1992 dollars.

Units:

This column denotes the units associated with 1992 ($) Unit Cost.

Quantity:

This column denotes the quantity for each unit operation.

Units:

This column denotes the units associated with Quantity.

Volume Factor:

Where appropriate, this column denotes the Volume Factor, which accounts for any expansion or reduction of a volume quantity, e.g., expansion of in-place soil as it is excavated. The Volume

Factor equals 1.000 for cost items where volume changes are not expected, which has no effect on the computed costs. For structural debris, the following volume factors were assumed:

- After dismantling, when the debris would be in the largest pieces the equipment could handle, the volume factor is increased by 0.6,
- After shredding, the volume factor is reduced by 0.3,
- After placement and compaction in the landfill, the volume factor is reduced by 0.3,
- After incineration, the volume factor is reduced by 0.3.

Mileage Factor:

The Mileage Factor specifies the round-trip mileage for each transportation cost item. The Mileage Factor equals 1.000 for all non-transportation cost items, which has no effect on the computed costs.

Other Factor:

The Other Factor is reserved for miscellaneous factors for which it would have been wasteful of presentation space to include a separate column, e.g., odor control. The Other Factor equals 1.000 for all other cost items, which has no effect on the computed costs. Odor control costs were increased by 20 percent, i.e., an Other Factor of 1.2.

1995 ($) Annual Cost:

Annual costs are presented only for the O&M (Long-Term Activities) portion of the cost estimates. These values are for informational purposes only and they provide only an approximation of the annual cost of the O&M (Long-Term Activities) after waste treatment has been completed. Note that each cost item may be applied at different times, thereby rendering the sum of the annual cost an approximate figure.

1995 ($) Total Cost:

The Total Cost is given in 1995 dollars. It is calculated by multiplying the following:

- 1992 ($) Unit Cost

- Quantity
- Volume Factor
- Mileage Factor
- Other Factor
- Single Payment Compound Amount Factor to convert the 1992 ($) Unit Cost to a 1995 ($) Unit Cost using a 5 percent discount rate. This factor equals 1.158.

1995 ($) PW Cost:

The Present Worth Cost in 1995 dollars is calculated by applying the appropriate fraction of the 1995 ($) Total Cost to the specified years, then discounting the applied value at each year back to Year 1 (1995) using a 5 percent discount rate.

Explanations for the calculations of subtotals and indirect costs are given on the cost estimate tables in the form of alphabetical references.

C3.0 UNIT RATE DEVELOPMENT

This section describes how unit rates were developed for the individual line items. The cost information is derived from vendor information, cost estimating manuals such as MEANS, related project information, and engineering judgement. The cost of PPE is included in the unit costs. The level of PPE was determined based on the process being performed and the expected nature of the debris. The levels of protection ranged from level D to Level B. Production rates were adjusted based on the level of worker protection.

C3.1 NO ACTION AND INSTITUTIONAL CONTROLS

No Action line items do not involve any capital, operations, or long-term costs and indicate that no additional action is proposed for all or part of the site.

The Institutional Controls General Response Action (GRA) can involve several different line items. The estimated cost of security fencing is $16.12/linear foot (LF) for the installation of

fence, a pedestrian gate, a swing gate, and signs at 200-foot intervals. The estimated annual maintenance cost for fences is estimated to be 10 percent of the installation cost, and the estimated cost of installing locks and boards includes the cost of boarding up all structure openings and restricting access using locks. The estimated capital cost for locks and boards is \$1.86/square foot (SF), with an annual maintenance cost of 10 percent of the capital cost.

C3.2 DEMOLITION, BACKFILL, AND TRANSPORTATION

The Demolition line item covers site-specific activities such as dismantling structures and removing debris from a site, or dropping structures within a region so that they may be covered by an impermeable cover. Capital costs for demolition are covered under the Mobilization/Demobilization line item. The estimated operations cost for demolishing process and non-process buildings is \$11.02/cubic yard (CY) of the standing building volume. Demolishing structures with potential agent presence differs from demolishing process history structure because the former requires the inclusion of costs for roll-away containers and a truck capable of loading the containers for agent monitoring purposes. Moreover, preliminary containment of agent demolition materials is required for agent monitoring, which elevates the estimate cost to \$23.31/CY.

Shredding is the process of sizing structural materials, such as metal, brick, or concrete. Shredding will reduce the amount of void space between the rubble therefore making landfilling or consolidation more cost effective. Shredding will also improve the handling characteristics of the material and allow representative sampling. Estimated costs for shredding are \$0.31 and \$13.32 for the capital and operations cost, respectively.

Repair of agent and manufacturing structures is the process of shoring or supporting perceived or unperceived weaknesses in structural integrity. This is applicable for all structures designated for treatment, salvage, and dismantling. It is estimated that the process history structures will cost \$4.35/CY and agent history structures \$5.28/CY.

The dust and safety sampling line item covers the standard air monitoring necessary to monitor the effectiveness of dust and vapor emission controls. This will ensure the protection of both site workers and the community. The estimated operations cost for sampling is $3.75/CY for manufacturing history structures.

Sampling of structures demolition debris is covered by four separate line items. The four line items covering structure debris sample are: Nonprocess History structures to be disposed in a nonhazardous landfill costing $42.61/CY, Process History structures to be disposed in a nonhazardous landfill costing $93.74/CY, Process and Agent History structures to be disposed in hazardous landfills costing $213.05/CY, and Process and Nonprocess structures to be consolidated costing $4.26/CY.

The Backfill line item covers the use of uncontaminated soils or other materials to fill holes created during the excavation of a structure. This process involves obtaining fill from uncontaminated on-post areas to backfill structural demolition/excavation sites, then compacting and grading the area. The estimated operations unit cost is $8.05/CY. After backfilling, the area will be revegitated, where necessary, at a cost of $0.08/SF.

The Transportation line items cover hauling demolition materials to on- or off-post treatment and disposal locations. The alternatives that involve transportation may consist of one or several different line items. The estimated operations costs for the off-post transportation of hazardous and nonhazardous material are $0.19/CY•MILE and $0.13/CY•MILE, respectively. The estimated operations costs for on-post transportation of hazardous and nonhazardous materials are $1.07/CY•MILE and $0.86/CY•MILE, respectively. There are two separate line items that cover the loading of debris prior to transporting. The estimated operations cost for loading hazardous debris is $1.55/CY and $1.28/CY for nonhazardous debris. The Transportation line items do not include capital costs, which were assumed to be covered in the Mobilization/Demobilization line item.

The Transfer station line item was employed to cover costs for a loading facility. This facility would transfer structural materials to off-post hauling vehicles. The estimated capital cost of this facility is $0.24/CY with a operating cost of $0.41/CY.

C3.3 STRUCTURES UNIQUE PROCESSES

The Structures Unique Processes line items cover treatment and action alternatives that apply only to the structures media. Capital and operations costs for treatment-based line items are based on the assumption of having enough equipment to clean the entire applicable surface area within 1 year. Structures Unique Processes line items include steam cleaning, sand blasting, vacuum dusting, pipe plugging, and salvage.

Steam cleaning is the process of removing contamination from building materials and equipment surfaces using heated water applied under pressure (EPA 1985). The estimated capital cost for steam cleaning is $0.29/SF and the operations costs are $1.84/SF. These line item costs include treatment unit purchase, labor, personal protective equipment (PPE), an accompanying water treatment system, system maintenance, and miscellaneous costs.

Sand blasting is a mechanical-scour treatment that involves the use of an abrasive such as sand or steel pellets to uniformly remove layers of superficial contamination (Battelle 1983). The estimated capital and operations unit costs for sand blasting are $0.38/SF and $2.75/SF respectively. Line item costs include treatment unit purchase, labor, PPE, an abrasive recycling system, system maintenance, and miscellaneous costs.

Vacuum dusting refers to the removal of superficial contamination using suction. The estimated capital cost for vacuum dusting is $0.03/SF which covers unit purchase costs, initial PPE, and other costs required to begin work. The estimated operation costs covering the system maintenance, labor, and miscellaneous costs are estimated at $1.02/SF.

Pipe plugging is the in situ solidification of contamination within a pipe to reduce contaminant mobility. The estimated operations costs were based on pipe diameter ranges to show the contrast in costs incurred by plugging differently sized pipes. Pipe volumes corresponding to the pipe plugging unit costs were calculated by dividing the Task 24 database totals by 10 percent and then multiplying by 60 percent. This algorithm changes collapsed pipe volume to standing pipe volume. The estimated operations costs estimate are $9,960/CY for pipe diameters of 2 inches or less, $2,119/CY for diameters ranging from 2 to 6 inches, and $678/CY for diameters of 6 inches or more. These cost estimates include labor, setup time, move time, pumping time, rental costs, and operations material cost.

Metals salvage is the recycling of uncontaminated materials such as nonprocess equipment and structural metals from nonprocess history structures, or decontaminated process equipment and piping from Process History structures. Salvage of metals has an estimated cost return of $52.61/CY.

C3.4 IN SITU THERMAL TREATMENT

The in situ thermal treatment alternative involves hot gas treatment. This process heats materials to temperatures of 750°F, releasing adsorbed contaminants and directing them to an off-gas treatment system. Costs were developed for both manufacturing and agent history structure. For Manufacturing and Agent History structures the estimated capital cost for hot gas is $0.81/SF, which includes the purchase of the treatment system, building closure materials, and labor for the closure of the room/building prior to treatment. The estimated operations cost for Manufacturing History structures is $12.49/SF and $15.96/SF for Agent History structures. These costs include treatment, fuel, and oversight during treatment.

C3.5 DIRECT THERMAL TREATMENT

The direct thermal treatment alternative involves off- and on-post rotary kiln incineration, i.e., the controlled combustion of organic wastes under oxidizing conditions. The treatment may also

partially volatilize some inorganics, so afterburners and scrubbers are used to treat off-gas emissions.

The off-post incineration line item cost estimate includes the cost of transportation to the facility and subsequent incineration. The operation costs are $4,110/CY.

On-post incineration capital costs estimates include the cost of purchasing a rotary kiln incinerator, afterburner, and scrubbers, which are assessed at $34.53/CY. The estimated labor, fuel, maintenance, and other operations costs are $133.31/CY.

C3.6 CONTAINMENT

Containment activities that require unit cost assessment are off- and on-post hazardous and nonhazardous waste landfills, on-post consolidation of materials in Basin A, and the use of capping of demolition materials within a region.

The On-Post Landfill line item costs were estimated based on the costs contained in the Task 27 report (EBASCO 1988b). The Task 27 report contains a detailed analysis of the size and costs incurred by the construction, operation, and long-term maintenance of the conceptual landfill. (For additional information, see Appendix B of the Soils DAA.) Unit cost estimates derived in the Task 27 report include a capital cost estimate of $5.72/CY for hazardous landfills and $4.32/CY for nonhazardous landfills. Procedures for operating and monitoring a hazardous and nonhazardous landfill are nearly identical; therefore, operations costs were estimated at $3.65/CY for both types of on-post landfill; long-term costs were assessed at $0.13/CY. The capital cost of landfill closure is $3.80/CY for the hazardous waste landfill and $3.70/CY for the nonhazardous waste landfill.

The Off-Post Landfill line item was estimated based on current rates quoted by current hazardous and nonhazardous landfill operators. These estimates are notably higher in the operations cost

category, but involve no capital or long-term monitoring unit costs. The estimates for operations unit cost for hazardous and nonhazardous landfills are \$76.00/CY and \$4.50/CY, respectively.

The Consolidation line item covers the process of sizing, spreading, and compacting materials in a centralized location. Basin A is currently the selected location for consolidation of structural and other materials. The estimated operations costs are \$7.26/CY. No capital or long-term costs were assumed.

The Capping line item covers capping structural demolition debris in place covered with a layer of clay and soil. Estimated costs for capping include a \$2.06/SF for operations cost and \$0.09/SF for long-term monitoring. The cost for revegitating the capped area is \$0.38/SF. In addition, a 5-year site review will be performed at a cost of \$5,400/YR.

C3.8 AGENT MATERIALS TREATMENT

Several treatment alternatives that were specifically chosen for agent-contaminated structures involve treating contaminated materials with a peroxide/hypochlorite caustic wash, sampling large containers of demolition materials with agent-monitoring equipment, and performing real-time air monitoring at the site.

The Peroxide/Hypochlorite line item covers treating agent contamination with a 1 to 3 parts mixture of hypochlorite and peroxide. The estimated capital cost, \$175.22/CY, includes building a facility in which to treat the waste, initial chemicals costs, and other preliminary costs. The estimated operations costs for this process are \$109.40/CY and cover chemical costs, labor costs, and facility maintenance.

The Agent Monitoring line item covers the determination of whether structural materials need to be treated by agent treatment methods. Agent monitoring is accomplished by placing demolition materials in covered roll-away containers and sampling the contents for agent. The estimated capital cost for this line item is \$2.29/LS, with an operations cost of \$22.53/CY.

The Air Sampling line item covers the costs involved in taking real-time and environmental air samples in proximity to the demolition sites with potential agent presence. Capital and operations cost estimates rely upon the equipment required to ensure accurate detection of any airborne contamination. The estimated operations cost is $2,940,789/YR.

C4.0 INDIRECT COSTS

Indirect costs are applied to the sum of the three main cost groups which include direct capital costs, direct O&M costs, and direct O&M long-term activities costs. To better evaluate and estimate the indirect costs, the capital and O&M operating costs were subdivided between direct costs and direct subcontract costs. The indirect costs include:

- Mobilization/Demobilization
- Indirects, Overhead, and Profit; or Contractor Markup
- Engineering Design
- Resident Engineering
- Contingency

The indirect costs vary due to the four consideration factors: medium group contamination; technologies selected; size of the project; and the duration. Based on the characteristics of each alternative as it is applied to the medium group, these factors assist in the development of indirect percentages as explained below. These indirect percentages are then applied to the direct costs to determine an overall total cost.

In order to provide a uniform basis of estimate, a cost markup matrix was developed based on the consideration factors to determine indirect costs percentages for direct capital and O&M costs. This matrix is presented as Table C4.0-1. Percentages for these estimates have been modified to distinguish relative cost differences between on-post and off-post activities and subcontracts. In some instances these factors were individually adjusted to be more representative of the individual alternative's complexity. The following sections explain the indirect markup factors and the application rationale.

C.4.1 MOBILIZATION/DEMOBILIZATION

Mobilization activities include construction/setup of contractor's support facilities, mobilization of heavy equipment, and relocation of management/supervisory personnel. Demobilization consists of decontamination and removal of contractor's equipment and facilities from the site. Costs for these activities are applied as a percentage of direct cost. These percentages applied vary from 2-7 percent as shown in markup matrix. For subcontract costs these percentages have been adjusted on a case-by-case basis, based on vendor quotes, and past knowledge and experience with similar projects.

C.4.2 INDIRECTS, OVERHEAD, AND PROFIT; OR CONTRACTOR MARKUP

Indirect Costs are calculated as a percentage of the sum of direct and mobilization/demobilization costs. Indirect costs cover the cost of on-site management, administrative, technical, health and safety, and supervisory staff, utilities for site support facilities (excluding production facilities), engineering tests, QA/QC program, preparation of work plans, submittals and as-built drawings, bonding costs, support facilities, and vehicle maintenance and operation. The range of percentages applied vary between 34-44 percent.

Subcontract cost for Indirects, Overhead, and Profit is identified as a Contractor Markup in the estimates and includes on-site management, administrative, technical, health and safety, supervisory staff, and subcontract profit. The Contractor's Markup ranged from 6-12 percent.

C.4.3 ENGINEERING DESIGN

The engineering design costs are estimated as a percentage of the sum of direct costs; mobilization/demobilization costs; and indirects, overhead, and profits. In general, engineering percentages were developed based on past experience of engineering costs on similar projects. These percentages are dependent upon the degree of complexity associated with the particularly alternative and the complexity of the treatment technology selected. Standard percentages ranging between 3-6 percent are applied to the estimates, however, certain alternatives required adjustments to reflect extenuating circumstances in the required design effort and were adjusted accordingly.

C.4.4 RESIDENT ENGINEERING

The resident engineering costs are estimated as a percentage of the sum of direct costs; mobilization/demobilization costs; and indirects, overhead, and profits. The alternative size, estimated project duration, and the remedial technology selected would determine the level of effort required for inspection and field engineering support to assure conformance and verification with the approved remedial design. Standard percentages ranging between 1-3 percent are applied to the estimates.

C.4.5 CONTINGENCY

Contingency is applied as a percentage of the sum of direct costs; mobilization/demobilization costs; indirects, overhead, and profits; and design and resident engineering costs. Contingency covers the specific provisions for unforeseeable elements of costs within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur. To effectively compare the design alternatives contained in this document, contingency has been applied to each alternative estimate based on the complexity of the treatment technology, unforeseen and unpredictable conditions, and/or uncertainties within the scope of this project. Other considerations which may affect the selection of contingency are levels of contamination; environmental media and climatic conditions; scheduling; changes in federal, state, or local regulations, and other issues unique to the project such as waste management permits and regulatory reviews.

Separate contingencies were developed for capital cost, operation and maintenance cost, and long-term activities which are illustrated in the markup matrix. A contingency range for this level of detail is typically 20-50 percent, which was for these estimates. The contingency to be provided for the current estimates was developed based on four cost parameters considered for each cost type, including levels of contamination, the complexity of the treatment technology, the size of the project, and the estimated duration of the activity. The amount of contingency applied to the

estimates in this document ranged between 25-40 percent based on these consideration factors and on past experience and knowledge with similar remedial projects.

C5.0 REFERENCES

RIC87026R01

EBASCO. 1988b, September. Final Report Hazardous Waste Land Disposal Facility Assessment, Task 27. Prepared for Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup.

Battelle 1983. Development of Navel Decontamination and Inerting Techniques for Explosives Contaminated Facilities. Phase I - Identification and Evaluation of Navel Decontamination Concepts. DRXTH-TE-CR-83208. Prepared for U.S. Army Toxic and Hazardous Materials Agency.

EPA (U.S. Environmental Protection Agency). 1985, March. Guide for Decontaminating Buildings, Structures, and Equipment at Superfund Sites. Prepared by PEI Associates, Incorporated, and Battelle Columbus Laboratories. EPA/650/2-85/028, NTIS PB85-20123Y.

Table C-1 Cost Estimate - Future Use, No Potential Exposure Medium Group
Alternative No. 1: No Action

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000			0	0
		Subtotal (A)													0	0
INDIRECT CAPITAL COSTS		COST CODE	Z													
Mob/Demob	0.0%	B = 0.000 * (A)													0	0
Indirects, Overhead & Profit	0.0%	C = 0.000 * (A+B)													0	0
Engineering Design	0.0%	D = 0.000 * (A+B+C)													0	0
Resident Engineering	0.0%	E = 0.000 * (A+B+C)													0	0
Contingency	0.0%	F = 0.000 * (A+B+C+D+E)													0	0
		Subtotal (G =B+C+D+E+F)													0	0
TOTAL CAPITAL COSTS (H = A+G)															0	0

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Table C-1 Cost Estimate - Future Use, No Potential Exposure Medium Group
Alternative No. 1: No Action

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000			0	0
		Subtotal (I)													0	0
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	Z													
Mob/Demob	0.0%	J = 0.000 * (I)													0	0
Indirects, Overhead & Profit	0.0%	K = 0.000 * (I+J)													0	0
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	0.0%	M = 0.000 * (I+J+K)													0	0
Contingency	0.0%	N = 0.000 * (I+J+K+L+M)													0	0
		Subtotal (O = J+K+L+M+N)													0	0
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000		0	0	0
		Subtotal (P)												0	0	0
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	Z													
Indirects, Overhead & Profit	0.0%	Q = 0.000 * (P)												0	0	0
Contingency	0.0%	R = 0.000 * (P+Q)												0	0	0
		Subtotal (S)												0	0	0
TOTAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														0	0	0
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															0	0

Table C-2 Cost Estimate - No Future Use, Nonmanufacturing History Medium Group
Alternative No. 1: No Action

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000			0	0
		Subtotal (A)													0	0
INDIRECT CAPITAL COSTS		COST CODE	Z													
Mob/Demob	0.0%	B = 0.000 * (A)													0	0
Indirects, Overhead & Profit	0.0%	C = 0.000 * (A+B)													0	0
Engineering Design	0.0%	D = 0.000 * (A+B+C)													0	0
Resident Engineering	0.0%	E = 0.000 * (A+B+C)													0	0
Contingency	0.0%	F = 0.000 * (A+B+C+D+E)													0	0
		Subtotal (G = B+C+D+E+F)													0	0
TOTAL CAPITAL COSTS (H = A+G)															0	0

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Table C-2 Cost Estimate - No Future Use, Nonmanufacturing History Medium Group
Alternative No. 1: No Action

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000			0	0
		Subtotal (I)													0	0
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	Z													
Mob/Demob	0.0%	J = 0.000 * (I)													0	0
Indirects, Overhead & Profit	0.0%	K = 0.000 * (I+J)													0	0
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	0.0%	M = 0.000 * (I+J+K)													0	0
Contingency	0.0%	N = 0.000 * (I+J+K+L+M)													0	0
		Subtotal (O = J+K+L+M+N)													0	0
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000		0	0	0
		Subtotal (P)												0	0	0
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	Z													
Indirects, Overhead & Profit	0.0%	Q = 0.000 * (P)												0	0	0
Contingency	0.0%	R = 0.000 * (P+Q)												0	0	0
		Subtotal (S)												0	0	0
TOTAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														0	0	0
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															0	0

Table C-3 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 1: No Action

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000			0	0
		Subtotal (A)													0	0
INDIRECT CAPITAL COSTS		COST CODE	Z													
Mob/Demob	0.0%	B = 0.000 * (A)													0	0
Indirects, Overhead & Profit	0.0%	C = 0.000 * (A+B)													0	0
Engineering Design	0.0%	D = 0.000 * (A+B+C)													0	0
Resident Engineering	0.0%	E = 0.000 * (A+B+C)													0	0
Contingency	0.0%	F = 0.000 * (A+B+C+D+E)													0	0
		Subtotal (G = B+C+D+E+F)													0	0
TOTAL CAPITAL COSTS (H = A+G)															0	0

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Table C-3 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 1: No Action

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000			0	0
		Subtotal (I)													0	0
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	Z													
Mob/Demob	0.0%	J = 0.000 * (I)													0	0
Indirects, Overhead & Profit	0.0%	K = 0.000 * (I+J)													0	0
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	0.0%	M = 0.000 * (I+J+K)													0	0
Contingency	0.0%	N = 0.000 * (I+J+K+L+M)													0	0
		Subtotal (O = J+K+L+M+N)													0	0
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000		0	0	0
		Subtotal (P)												0	0	0
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	Z													
Indirects, Overhead & Profit	0.0%	Q = 0.000 * (P)												0	0	0
Contingency	0.0%	R = 0.000 * (P+Q)												0	0	0
		Subtotal (S)												0	0	0
TOTAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														0	0	0
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															0	0

Table C-4 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 2: Pipe Plugs, Locks/Boards/Fences/Signs

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Locks & Boards			LS	1	--	1.86	/SF	379,291	SF	1.000	1.000	1.000			805,000	805,000
Fences & Signs			LS	1	--	16.12	/LF	57,102	LF	1.000	1.000	1.000			1,050,000	1,050,000
		Subtotal (A)													1,855,000	1,855,000
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													60,000	60,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													747,000	747,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													80,000	80,000
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													33,000	33,000
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													729,000	729,000
		Subtotal (G =B+C+D+E+F)													1,649,000	1,649,000
TOTAL CAPITAL COSTS (H = A+G)															3,505,000	3,505,000

Table C-4 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 2: Pipe Plugs, Locks/Boards/Fences/Signs

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Pipe Plugging - ID <= 2 in.			A	1	2	9,960.00	/CY	334	CY	1.000	1.000	1.000			3,795,000	3,705,000
Pipe Plugging - 2 in. < ID <= 6 in.			A	1	2	2,119.00	/CY	3,673	CY	1.000	1.000	1.000			8,882,000	8,670,000
Pipe Plugging - ID > 6 in.			A	1	2	678.00	/CY	2,671	CY	1.000	1.000	1.000			2,067,000	2,018,000
		Subtotal (I)													14,743,000	14,392,000
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	HMMS													
Mob/Demob	5.1%	J = 0.051 * (I)													756,000	738,000
Indirects, Overhead & Profit	40.3%	K = 0.403 * (I+J)													6,238,000	6,090,000
Engineering Design	4.5%	L = 0.045 * (I+J+K)													978,000	955,000
Resident Engineering	2.0%	M = 0.020 * (I+J+K)													435,000	424,000
Contingency	31.3%	N = 0.313 * (I+J+K+L+M)													7,234,000	7,062,000
		Subtotal (O = J+K+L+M+N)													15,641,000	15,269,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
Locks & Boards			A	2	30	0.19	/SF	379,291	SF	1.000	1.000	1.000		82,000	2,385,000	1,245,000
Fences & Signs			A	2	30	1.61	/LF	57,102	LF	1.000	1.000	1.000		105,000	3,042,000	1,588,000
		Subtotal (P)												187,000	5,427,000	2,834,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												73,000	2,117,000	1,105,000
Contingency	30.0%	R = 0.300 * (P+Q)												78,000	2,263,000	1,182,000
		Subtotal (S)												151,000	4,380,000	2,287,000
TOTAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														338,000	40,192,000	34,782,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															43,700,000	38,300,000

Table C-5 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 8: Hot Gas, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Hot Gas for Manufacturing Structures			LS	1	--	0.81	/SF	2,528,608	SF	1.000	1.000	1.000			2,337,000	2,337,000
Shredding Structure Debris			LS	1	--	0.31	/CY	78,394	CY	1.000	1.000	1.000			28,000	28,000
On-post Nonhazardous Waste Landfill			LS	1	--	4.32	/CY	72,588	CY	1.000	1.000	1.000			358,000	358,000
On-post Nonhazardous Waste Landfill Closure			LS	3	--	3.70	/CY	72,588	CY	1.000	1.000	1.000			306,000	278,000
		Subtotal (A)													3,029,000	3,001,000
INDIRECT CAPITAL COSTS		COST CODE	LHMS													
Mob/Demob	4.5%	B = 0.045 * (A)													136,000	135,000
Indirects, Overhead & Profit	37.8%	C = 0.378 * (A+B)													1,195,000	1,184,000
Engineering Design	6.5%	D = 0.065 * (A+B+C)													283,000	281,000
Resident Engineering	1.8%	E = 0.018 * (A+B+C)													76,000	76,000
Contingency	30.0%	F = 0.300 * (A+B+C+D+E)													1,416,000	1,403,000
		Subtotal (G = B+C+D+E+F)													3,107,000	3,078,000
TOTAL CAPITAL COSTS (H = A+G)															6,137,000	6,079,000

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Table C-5 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 8: Hot Gas, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	1	3.75	/CY	631,646	CY	1.000	1.000	1.000			2,703,000	2,703,000
Repair of Manufacturing Structures			A	1	1	4.35	/CY	631,646	CY	1.000	1.000	1.000			3,136,000	3,136,000
Hot Gas for Manufacturing Structures			A	1	2	12.49	/SF	2,528,608	SF	1.000	1.000	1.000			36,041,000	35,183,000
Demolition			A	1	3	11.02	/CY	631,646	CY	1.000	1.000	1.000			7,943,000	7,571,000
Loading Nonhazardous Debris			A	1	3	1.28	/CY	78,394	CY	1.600	1.000	1.000	Expansion		183,000	175,000
Transportation of Nonhazardous Waste On-post			A	1	3	0.86	/CY	78,394	CY	1.600	4.000	1.000	Expansion, Miles		492,000	469,000
Shredding Structure Debris			A	1	3	13.32	/CY	78,394	CY	1.600	1.000	1.000	Expansion		1,907,000	1,817,000
Debris Sampling, Process, Nonhaz Disposal			A	1	3	93.74	/CY	72,588	CY	1.300	1.000	1.000	Expansion		10,094,000	9,621,000
Loading Nonhazardous Debris			A	1	3	1.28	/CY	72,588	CY	1.300	1.000	1.000	Expansion		138,000	131,000
Transportation of Nonhazardous Waste On-post			A	1	3	0.86	/CY	72,588	CY	1.300	4.000	1.000	Expansion, Miles		370,000	353,000
On-post Nonhazardous Waste Landfill			A	1	3	4.07	/CY	72,588	CY	1.000	1.000	1.000			337,000	321,000
Backfill of Structure Excavation			A	1	3	8.05	/CY	32,687	CY	1.000	1.000	1.000			300,000	286,000
Restoration of Structure Excavation			A	1	3	0.08	/SF	32,687	CY	1.000	1.000	1.000			3,000	3,000
Subtotal (I)															63,648,000	61,770,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	3	(52.61)	/TON	38,407	TON	1.000	1.000	1.000			(2,306,000)	(2,198,000)
Subtotal (I')															(2,306,000)	(2,198,000)
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMLMST													
Mob/Demob	2.0%	J = 0.020 * (I)													1,273,000	1,235,000
Indirects, Overhead & Profit	37.8%	K = 0.378 * (I+J)													24,508,000	23,784,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	2.0%	M = 0.020 * (I+J+K)													1,789,000	1,736,000
Contingency	30.0%	N = 0.300 * (I+J+K+L+M)													27,365,000	26,558,000
		Subtotal (O = J+K+L+M+N)													54,934,000	53,313,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Nonhazardous Waste Landfill Closure			A	3	30	0.13	/CY	72,588	CY	1.000	1.000	1.000		11,000	302,000	153,000
Subtotal (P)														11,000	302,000	153,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												4,000	118,000	60,000
Contingency	30.0%	R = 0.300 * (P+Q)												4,000	126,000	64,000
Subtotal (S)														9,000	243,000	123,000
TOTAL O&M COSTS (T = I+I'+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														19,000	116,821,000	113,161,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															123,000,000	119,000,000

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Table C-6 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 9: Vacuum Dusting, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Vacuum Dusting			LS	1	--	0.03	/SF	503,652	SF	1.000	1.000	1.000			17,000	17,000
Shredding Structure Debris			LS	1	--	0.31	/CY	78,394	CY	1.000	1.000	1.000			28,000	28,000
On-post Nonhazardous Waste Landfill			LS	1	--	4.32	/CY	72,588	CY	1.000	1.000	1.000			358,000	358,000
On-post Nonhazardous Waste Landfill Closure			LS	3	--	3.70	/CY	72,588	CY	1.000	1.000	1.000			306,000	278,000
		Subtotal (A)													709,000	681,000
INDIRECT CAPITAL COSTS		COST CODE	LMSS													
Mob/Demob	3.9%	B = 0.039 * (A)													27,000	26,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													287,000	276,000
Engineering Design	4.5%	D = 0.045 * (A+B+C)													46,000	44,000
Resident Engineering	1.5%	E = 0.015 * (A+B+C)													15,000	15,000
Contingency	27.5%	F = 0.275 * (A+B+C+D+E)													299,000	287,000
		Subtotal (G = B+C+D+E+F)													675,000	648,000
TOTAL CAPITAL COSTS (H = A+G)															1,384,000	1,329,000

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Table C-6 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup

Alternative No. 9: Vacuum Dusting, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	631,646	CY	1.000	1.000	1.000			2,703,000	2,639,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	631,646	CY	1.000	1.000	1.000			3,136,000	3,061,000
Vacuum Dusting			A	1	2	1.02	/SF	503,652	SF	1.000	1.000	1.000			586,000	572,000
Demolition			A	1	3	11.02	/CY	631,646	CY	1.000	1.000	1.000			7,943,000	7,571,000
Loading Nonhazardous Debris			A	1	3	1.28	/CY	78,394	CY	1.600	1.000	1.000	Expansion		183,000	175,000
Transportation of Nonhazardous Waste On-post			A	1	3	0.86	/CY	78,394	CY	1.600	4.000	1.000	Expansion, Miles		492,000	469,000
Shredding Structure Debris			A	1	3	13.32	/CY	78,394	CY	1.600	1.000	1.000	Expansion		1,907,000	1,817,000
Debris Sampling, Process, Nonhaz Disposal			A	1	3	93.74	/CY	72,588	CY	1.300	1.000	1.000	Expansion		10,094,000	9,621,000
Loading Nonhazardous Debris			A	1	3	1.28	/CY	72,588	CY	1.300	1.000	1.000	Expansion		138,000	131,000
Transportation of Nonhazardous Waste On-post			A	1	3	0.86	/CY	72,588	CY	1.300	4.000	1.000	Expansion, Miles		370,000	353,000
On-post Nonhazardous Waste Landfill			A	1	3	4.07	/CY	72,588	CY	1.000	1.000	1.000			337,000	321,000
Backfill of Structure Excavation			A	1	3	8.05	/CY	32,687	CY	1.000	1.000	1.000			300,000	286,000
Restoration of Structure Excavation			A	1	3	0.08	/SF	32,687	CY	1.000	1.000	1.000			3,000	3,000
Subtotal (I)															28,193,000	27,020,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	3	(52.61)	/TON	38,407	TON	1.000	1.000	1.000			(2,306,000)	(2,198,000)
Subtotal (I')															(2,306,000)	(2,198,000)
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMLMST													
Mob/Demob	2.0%	J = 0.020 * (I)													564,000	540,000
Indirects, Overhead & Profit	37.8%	K = 0.378 * (I+J)													10,856,000	10,404,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	2.0%	M = 0.020 * (I+J+K)													792,000	759,000
Contingency	30.0%	N = 0.300 * (I+J+K+L+M)													12,122,000	11,617,000
		Subtotal (O = J+K+L+M+N)													24,334,000	23,321,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Nonhazardous Waste Landfill Closure			A	3	30	0.13	/CY	72,588	CY	1.000	1.000	1.000		11,000	302,000	153,000
Subtotal (P)														11,000	302,000	153,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												4,000	118,000	60,000
Contingency	30.0%	R = 0.300 * (P+Q)												4,000	126,000	64,000
Subtotal (S)														9,000	243,000	123,000
TOTAL O&M COSTS (T = I+I'+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														19,000	50,766,000	48,420,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															52,200,000	49,700,000

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Table C-7 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 9A: Steam Cleaning, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Steam Cleaning			LS	1	--	0.29	/SF	367,433	SF	1.000	1.000	1.000			122,000	122,000
Shredding Structure Debris			LS	1	--	0.31	/CY	78,394	CY	1.000	1.000	1.000			28,000	28,000
On-post Nonhazardous Waste Landfill			LS	1	--	4.32	/CY	72,588	CY	1.000	1.000	1.000			358,000	358,000
On-post Nonhazardous Waste Landfill Closure			LS	3	--	3.70	/CY	72,588	CY	1.000	1.000	1.000			306,000	278,000
		Subtotal (A)													814,000	785,000
INDIRECT CAPITAL COSTS		COST CODE	LMSS													
Mob/Demob	3.9%	B = 0.039 * (A)													32,000	30,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													330,000	318,000
Engineering Design	4.5%	D = 0.045 * (A+B+C)													53,000	51,000
Resident Engineering	1.5%	E = 0.015 * (A+B+C)													18,000	17,000
Contingency	27.5%	F = 0.275 * (A+B+C+D+E)													342,000	330,000
		Subtotal (G = B+C+D+E+F)													774,000	747,000
TOTAL CAPITAL COSTS (H = A+G)															1,588,000	1,532,000

Table C-7 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup

Alternative No. 9A: Steam Cleaning, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	631,646	CY	1.000	1.000	1.000			2,703,000	2,639,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	631,646	CY	1.000	1.000	1.000			3,136,000	3,061,000
Steam Cleaning			A	1	2	1.84	/SF	367,433	SF	1.000	1.000	1.000			772,000	753,000
Demolition			A	1	3	11.02	/CY	631,646	CY	1.000	1.000	1.000			7,943,000	7,571,000
Loading Nonhazardous Debris			A	1	3	1.28	/CY	78,394	CY	1.600	1.000	1.000	Expansion		183,000	175,000
Transportation of Nonhazardous Waste On-post			A	1	3	0.86	/CY	78,394	CY	1.600	4.000	1.000	Expansion, Miles		492,000	469,000
Shredding Structure Debris			A	1	3	13.32	/CY	78,394	CY	1.600	1.000	1.000	Expansion		1,907,000	1,817,000
Debris Sampling, Process, Nonhaz Disposal			A	1	3	93.74	/CY	72,588	CY	1.300	1.000	1.000	Expansion		10,094,000	9,621,000
Loading Nonhazardous Debris			A	1	3	1.28	/CY	72,588	CY	1.300	1.000	1.000	Expansion		138,000	131,000
Transportation of Nonhazardous Waste On-post			A	1	3	0.86	/CY	72,588	CY	1.300	4.000	1.000	Expansion, Miles		370,000	353,000
On-post Nonhazardous Waste Landfill			A	1	3	4.07	/CY	72,588	CY	1.000	1.000	1.000			337,000	321,000
Backfill of Structure Excavation			A	1	3	8.05	/CY	32,687	CY	1.000	1.000	1.000			300,000	286,000
Restoration of Structure Excavation			A	1	3	0.08	/SF	32,687	CY	1.000	1.000	1.000			3,000	3,000
		Subtotal (I)													28,379,000	27,201,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	3	(52.61)	/TON	38,407	TON	1.000	1.000	1.000			(2,306,000)	(2,198,000)
		Subtotal (I')													(2,306,000)	(2,198,000)
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMLMST													
Mob/Demob	2.0%	J = 0.020 * (I)													568,000	544,000
Indirects, Overhead & Profit	37.8%	K = 0.378 * (I+J)													10,927,000	10,474,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	2.0%	M = 0.020 * (I+J+K)													797,000	764,000
Contingency	30.0%	N = 0.300 * (I+J+K+L+M)													12,201,000	11,695,000
		Subtotal (O = J+K+L+M+N)													24,494,000	23,477,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Nonhazardous Waste Landfill Closure			A	3	30	0.13	/CY	72,588	CY	1.000	1.000	1.000		11,000	302,000	153,000
		Subtotal (P)												11,000	302,000	153,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												4,000	118,000	60,000
Contingency	30.0%	R = 0.300 * (P+Q)												4,000	126,000	64,000
		Subtotal (S)												9,000	243,000	123,000
TOTAL O&M COSTS (T = I+I'+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														19,000	51,111,000	48,757,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															52,700,000	50,300,000

Table C-8 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 10: Sand Blasting, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill

Cost Item	Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS														
Sand Blasting	LS	1	--	0.38	/SF	503,652	SF	1.000	1.000	1.000			218,000	218,000
Shredding Structure Debris	LS	1	--	0.31	/CY	78,394	CY	1.000	1.000	1.000			28,000	28,000
On-post Nonhazardous Waste Landfill	LS	1	--	4.32	/CY	72,588	CY	1.000	1.000	1.000			358,000	358,000
On-post Nonhazardous Waste Landfill Closure	LS	3	--	3.70	/CY	72,588	CY	1.000	1.000	1.000			306,000	278,000
Subtotal (A)													910,000	882,000

INDIRECT CAPITAL COSTS		COST CODE	LMSS	1995 ($) Total Cost	1995 ($) PW Cost
Mob/Demob	3.9%	B = 0.039 * (A)		35,000	34,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)		369,000	357,000
Engineering Design	4.5%	D = 0.045 * (A+B+C)		59,000	57,000
Resident Engineering	1.5%	E = 0.015 * (A+B+C)		20,000	19,000
Contingency	27.5%	F = 0.275 * (A+B+C+D+E)		383,000	371,000
		Subtotal (G = B+C+D+E+F)		866,000	839,000
TOTAL CAPITAL COSTS (H = A+G)				1,777,000	1,721,000

Table C-8 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 10: Sand Blasting, Dismantling, Salvage, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	631,646	CY	1.000	1.000	1.000			2,703,000	2,639,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	631,646	CY	1.000	1.000	1.000			3,136,000	3,061,000
Sand Blasting			A	1	2	2.75	/SF	503,652	SF	1.000	1.000	1.000			1,581,000	1,543,000
Demolition			A	1	3	11.02	/CY	631,646	CY	1.000	1.000	1.000			7,943,000	7,571,000
Loading Nonhazardous Debris			A	1	3	1.28	/CY	78,394	CY	1.600	1.000	1.000	Expansion		183,000	175,000
Transportation of Nonhazardous Waste On-post			A	1	3	0.86	/CY	78,394	CY	1.600	4.000	1.000	Expansion, Miles		492,000	469,000
Shredding Structure Debris			A	1	3	13.32	/CY	78,394	CY	1.600	1.000	1.000	Expansion		1,907,000	1,817,000
Debris Sampling, Process, Nonhaz Disposal			A	1	3	93.74	/CY	72,588	CY	1.300	1.000	1.000	Expansion		10,094,000	9,621,000
Loading Nonhazardous Debris			A	1	3	1.28	/CY	72,588	CY	1.300	1.000	1.000	Expansion		138,000	131,000
Transportation of Nonhazardous Waste On-post			A	1	3	0.86	/CY	72,588	CY	1.300	4.000	1.000	Expansion, Miles		370,000	353,000
On-post Nonhazardous Waste Landfill			A	1	3	4.07	/CY	72,588	CY	1.000	1.000	1.000			337,000	321,000
Backfill of Structure Excavation			A	1	3	8.05	/CY	32,687	CY	1.000	1.000	1.000			300,000	286,000
Restoration of Structure Excavation			A	1	3	0.08	/SF	32,687	CY	1.000	1.000	1.000			3,000	3,000
Subtotal (I)															29,188,000	27,991,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	3	(52.61)	/TON	38,407	TON	1.000	1.000	1.000			(2,306,000)	(2,198,000)
Subtotal (I')															(2,306,000)	(2,198,000)
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMLMST													
Mob/Demob	2.0%	J = 0.020 * (I)													584,000	560,000
Indirects, Overhead & Profit	37.8%	K = 0.378 * (I+J)													11,239,000	10,778,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	2.0%	M = 0.020 * (I+J+K)													820,000	787,000
Contingency	30.0%	N = 0.300 * (I+J+K+L+M)													12,549,000	12,035,000
		Subtotal (O = J+K+L+M+N)													25,192,000	24,159,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Nonhazardous Waste Landfill Closure			A	3	30	0.13	/CY	72,588	CY	1.000	1.000	1.000		11,000	302,000	153,000
Subtotal (P)														11,000	302,000	153,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												4,000	118,000	60,000
Contingency	30.0%	R = 0.300 * (P+Q)												4,000	126,000	64,000
Subtotal (S)														9,000	243,000	123,000
TOTAL O&M COSTS (T = I+I'+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														19,000	52,619,000	50,228,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															54,400,000	51,900,000

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Table C-9 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 12: Dismantling, Salvage, Off-Post Rotary Kiln Incineration, Off-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Shredding Structure Debris			LS	1	--	0.31	/CY	78,394	CY	1.000	1.000	1.000			28,000	28,000
Transfer Station			LS	1	--	0.24	/CY	72,588	CY	1.000	1.000	1.000			20,000	20,000
		Subtotal (A)													48,000	48,000
INDIRECT CAPITAL COSTS		COST CODE	MMLS													
Mob/Demob	4.5%	B = 0.045 * (A)													2,000	2,000
Indirects, Overhead & Profit	37.8%	C = 0.378 * (A+B)													19,000	19,000
Engineering Design	4.5%	D = 0.045 * (A+B+C)													3,000	3,000
Resident Engineering	1.8%	E = 0.018 * (A+B+C)													1,000	1,000
Contingency	28.8%	F = 0.288 * (A+B+C+D+E)													21,000	21,000
		Subtotal (G =B+C+D+E+F)													46,000	46,000
DIRECT SUBCONTRACT CAPITAL COSTS															0	0
		Subtotal (A1)													0	0
INDIRECT SUBCONTRACT CAPITAL COSTS		COST CODE: 0														
Mob/Demob	0.0%	B1 = 0.000 * (A1)													0	0
Contractor Markup	0.0%	C1 = 0.000 * (A1+B1)													0	0
Engineering Design	0.0%	D1 = 0.000 * (A1+B1+C1)													0	0
Resident Engineering	0.0%	E1 = 0.000 * (A1+B1+C1)													0	0
Contingency	0.0%	F1 = 0.000 * (A1+B1+C1+D1+E1)													0	0
		Subtotal (G1 = B1+C1+D1+E1+F1)													0	0
TOTAL CAPITAL COSTS (H = A+G)															93,000	93,000

Table C-9 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 12: Dismantling, Salvage, Off-Post Rotary Kiln Incineration, Off-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	631,646	CY	1.000	1.000	1.000			2,703,000	2,639,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	631,646	CY	1.000	1.000	1.000			3,136,000	3,061,000
Demolition			A	1	2	11.02	/CY	631,646	CY	1.000	1.000	1.000			7,943,000	7,754,000
Loading Hazardous Debris			A	1	2	1.55	/CY	78,394	CY	1.600	1.000	1.000	Expansion		222,000	217,000
Transportation of Hazardous Waste On-post			A	1	2	1.07	/CY	78,394	CY	1.600	4.000	1.000	Expansion, Miles		613,000	598,000
Shredding Structure Debris			A	1	2	13.32	/CY	78,394	CY	1.600	1.000	1.000	Expansion		1,907,000	1,861,000
Debris Sampling, Process/Agent, Haz Disposal			A	1	2	213.05	/CY	72,588	CY	1.300	1.000	1.000	Expansion		22,942,000	22,396,000
Loading Hazardous Debris			A	1	2	1.55	/CY	72,588	CY	1.300	1.000	1.000	Expansion		167,000	163,000
Transfer Station			A	1	2	0.41	/CY	72,588	CY	1.300	1.000	1.000	Expansion		44,000	43,000
Backfill of Structure Excavation			A	1	2	8.05	/CY	32,687	CY	1.000	1.000	1.000			300,000	293,000
Restoration of Structure Excavation			A	1	2	0.08	/SF	32,687	CY	1.000	1.000	1.000			3,000	3,000
		Subtotal (I)													39,980,000	39,028,000
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMLSST													
Mob/Demob	2.0%	J = 0.020 * (I)													800,000	781,000
Indirects, Overhead & Profit	37.8%	K = 0.378 * (I+J)													15,394,000	15,028,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	1.8%	M = 0.018 * (I+J+K)													983,000	960,000
Contingency	28.8%	N = 0.288 * (I+J+K+L+M)													16,150,000	15,765,000
		Subtotal (O = J+K+L+M+N)													33,327,000	32,533,000
DIRECT SUBCONTRACT O&M COSTS (OPERATIONS)																
Off-post Rotary Kiln Incineration			A	1	2	4,110.00	/CY	72,588	CY	1.000	1.000	1.000			340,452,000	332,346,000
		Subtotal (I')													340,452,000	332,346,000
INDIRECT SUBCONTR. O&M COSTS (OPERATIONS)		COST CODE:	A													
Mob/Demob	0.0%	J' = 0.000 * (I')													0	0
Contractor Markup	6.0%	K' = 0.060 * (I'+J')													20,427,000	19,941,000
Engineering Design	0.0%	L' = 0.000 * (I'+J'+K')													0	0
Resident Engineering	0.1%	M' = 0.001 * (I'+J'+K')													361,000	352,000
Contingency	30.0%	N' = 0.300 * (I'+J'+K'+L'+M')													108,372,000	105,792,000
		Subtotal (O' = J'+K'+L'+M'+N')													129,160,000	126,085,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	2	(52.61)	/TON	38,407	TON	1.000	1.000	1.000			(2,306,000)	(2,251,000)
		Subtotal (V)													(2,306,000)	(2,251,000)
TOTAL O&M COSTS (OPERATIONS) (P = I+I'+O+O'+V)															540,612,000	527,741,000

Table C-9 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 12: Dismantling, Salvage, Off-Post Rotary Kiln Incineration, Off-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)														0	0	0
		Subtotal (Q)												0	0	0
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	0											0	0	0
Indirects, Overhead & Profit	0.0%	R = 0.000 * (Q)												0	0	0
Contingency	0.0%	S = 0.000 * (Q+R)														
		Subtotal (T)												0	0	0
TOTAL O&M COSTS (LONG-TERM ACTIVITIES) (U = Q+T)														0	0	0
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+P+U)															541,000,000	528,000,000

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Table C-10 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 13: Dismantling, Salvage, On-Post Rotary Kiln Incineration, On-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Shredding Structure Debris			LS	1	--	0.31	/CY	78,394	CY	1.000	1.000	1.000			28,000	28,000
On-post Hazardous Waste Landfill			LS	1	--	5.72	/CY	72,588	CY	0.700	1.000	1.000	Reduction		332,000	332,000
On-post Hazardous Waste Landfill Closure			LS	2	--	3.80	/CY	72,588	CY	0.700	1.000	1.000	Reduction		220,000	210,000
		Subtotal (A)													580,000	569,000
INDIRECT CAPITAL COSTS		COST CODE	LLMS													
Mob/Demob	3.3%	B = 0.033 * (A)													19,000	19,000
Indirects, Overhead & Profit	37.8%	C = 0.378 * (A+B)													226,000	222,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													25,000	24,000
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													11,000	10,000
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													223,000	219,000
		Subtotal (G =B+C+D+E+F)													503,000	494,000
DIRECT SUBCONTRACT CAPITAL COSTS																
On-post Rotary Kiln Incineration			LS	1	--	36.37	/CY	72,588	CY	1.000	1.000	1.000			3,013,000	3,013,000
		Subtotal (A1)													3,013,000	3,013,000
INDIRECT SUBCONTRACT CAPITAL COSTS		COST CODE:	C													
Mob/Demob	2.0%	B1 = 0.020 * (A1)													60,000	60,000
Contractor Markup	10.0%	C1 = 0.100 * (A1+B1)													307,000	307,000
Engineering Design	9.0%	D1 = 0.090 * (A1+B1+C1)													304,000	304,000
Resident Engineering	3.0%	E1 = 0.030 * (A1+B1+C1)													101,000	101,000
Contingency	30.0%	F1 = 0.300 * (A1+B1+C1+D1+E1)													1,136,000	1,136,000
		Subtotal (G1 = B1+C1+D1+E1+F1)													1,909,000	1,909,000
TOTAL CAPITAL COSTS (H = A+G)															6,005,000	5,985,000

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Table C-10 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 13: Dismantling, Salvage, On-Post Rotary Kiln Incineration, On-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	631,646	CY	1.000	1.000	1.000			2,703,000	2,639,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	631,646	CY	1.000	1.000	1.000			3,136,000	3,061,000
Demolition			A	1	2	11.02	/CY	631,646	CY	1.000	1.000	1.000			7,943,000	7,754,000
Loading Hazardous Debris			A	1	2	1.55	/CY	78,394	CY	1.600	1.000	1.000	Expansion		222,000	217,000
Transportation of Hazardous Waste On-post			A	1	2	1.07	/CY	78,394	CY	1.600	4.000	1.000	Expansion, Miles		613,000	598,000
Shredding Structure Debris			A	1	2	13.32	/CY	78,394	CY	1.600	1.000	1.000	Expansion		1,907,000	1,861,000
Debris Sampling, Process/Agent, Haz Disposal			A	1	2	213.05	/CY	72,588	CY	1.300	1.000	1.000	Expansion		22,942,000	22,396,000
Loading Hazardous Debris			A	1	2	1.55	/CY	72,588	CY	1.300	1.000	1.000	Expansion		167,000	163,000
Transportation of Hazardous Waste On-post			A	1	2	1.07	/CY	72,588	CY	1.300	4.000	1.000	Expansion, Miles		461,000	450,000
Loading Hazardous Debris			A	1	2	1.55	/CY	72,588	CY	1.300	1.000	1.000	Expansion		167,000	163,000
Transportation of Hazardous Waste On-post			A	1	2	1.07	/CY	72,588	CY	0.700	4.000	1.000	Reduction, Miles		248,000	242,000
On-post Nonhazardous Waste Landfill			A	1	2	4.07	/CY	72,588	CY	0.700	1.000	1.000	Reduction		236,000	230,000
Backfill of Structure Excavation			A	1	2	8.05	/CY	32,687	CY	1.000	1.000	1.000			300,000	293,000
Restoration of Structure Excavation			A	1	2	0.08	/SF	32,687	CY	1.000	1.000	1.000			3,000	3,000
		Subtotal (I)													41,048,000	40,070,000
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMLSST													
Mob/Demob	2.0%	J = 0.020 * (I)													821,000	801,000
Indirects, Overhead & Profit	37.8%	K = 0.378 * (I+J)													15,805,000	15,429,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	1.8%	M = 0.018 * (I+J+K)													1,009,000	985,000
Contingency	28.8%	N = 0.288 * (I+J+K+L+M)													16,581,000	16,186,000
		Subtotal (O = J+K+L+M+N)													34,217,000	33,402,000
DIRECT SUBCONTRACT O&M COSTS (OPERATIONS)																
On-post Rotary Kiln Incineration			A	1	2	144.36	/CY	72,588	CY	1.000	1.000	1.000			11,958,000	11,673,000
		Subtotal (I')													11,958,000	11,673,000
INDIRECT SUBCONTR. O&M COSTS (OPERATIONS)		COST CODE:	D													
Mob/Demob	0.0%	J' = 0.000 * (I')													0	0
Contractor Markup	10.0%	K' = 0.100 * (I'+J')													1,196,000	1,167,000
Engineering Design	0.0%	L' = 0.000 * (I'+J'+K')													0	0
Resident Engineering	2.0%	M' = 0.020 * (I'+J'+K')													263,000	257,000
Contingency	40.0%	N' = 0.400 * (I'+J'+K'+L'+M')													5,367,000	5,239,000
		Subtotal (O' = J'+K'+L'+M'+N')													6,826,000	6,663,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	2	(52.61)	/TON	38,407	TON	1.000	1.000	1.000			(2,305,813)	(2,250,913)
		Subtotal (V)													(2,306,000)	(2,251,000)
TOTAL O&M COSTS (OPERATIONS) (P = I+I'+O+O'+V)															91,742,000	89,558,000

Table C-10 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 13: Dismantling, Salvage, On-Post Rotary Kiln Incineration, On-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Nonhazardous Waste Landfill Closure			A	2	30	0.13	/CY	72,588	CY	1.000	1.000	1.000		11,000	312,000	163,000
Subtotal (Q)														11,000	312,000	163,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	R = 0.390 * (Q)												4,000	122,000	64,000
Contingency	30.0%	S = 0.300 * (Q+R)												4,000	130,000	68,000
Subtotal (T)														9,000	252,000	132,000
TOTAL O&M COSTS (LONG-TERM ACTIVITIES) (U = Q+T)														19,000	564,000	295,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+P+U)															98,300,000	95,800,000

Table C-11 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 19: Dismantling, Salvage, On-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Shredding Structure Debris			LS	1	--	0.31	/CY	78,394	CY	1.000	1.000	1.000			28,000	28,000
On-post Hazardous Waste Landfill			LS	1	--	5.72	/CY	72,588	CY	1.000	1.000	1.000			474,000	474,000
On-post Hazardous Waste Landfill Closure			LS	2	--	3.80	/CY	72,588	CY	1.000	1.000	1.000			315,000	300,000
		Subtotal (A)													816,000	801,000
INDIRECT CAPITAL COSTS		COST CODE	LLMS													
Mob/Demob	3.3%	B = 0.033 * (A)													27,000	26,000
Indirects, Overhead & Profit	37.8%	C = 0.378 * (A+B)													318,000	312,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													35,000	34,000
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													15,000	14,000
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													318,000	312,000
		Subtotal (G =B+C+D+E+F)													712,000	699,000
TOTAL CAPITAL COSTS (H = A+G)															1,528,000	1,500,000

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STRUCTURES DAA

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Table C-11 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 19: Dismantling, Salvage, On-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	631,646	CY	1.000	1.000	1.000			2,703,000	2,639,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	631,646	CY	1.000	1.000	1.000			3,136,000	3,061,000
Demolition			A	1	2	11.02	/CY	631,646	CY	1.000	1.000	1.000			7,943,000	7,754,000
Loading Hazardous Debris			A	1	2	1.55	/CY	78,394	CY	1.600	1.000	1.000	Expansion		222,000	217,000
Transportation of Hazardous Waste On-post			A	1	2	1.07	/CY	78,394	CY	1.600	4.000	1.000	Expansion, Miles		613,000	598,000
Shredding Structure Debris			A	1	2	13.32	/CY	78,394	CY	1.600	1.000	1.000	Expansion		1,907,000	1,861,000
Debris Sampling, Process/Agent, Haz Disposal			A	1	2	213.05	/CY	72,588	CY	1.300	1.000	1.000	Expansion		22,942,000	22,396,000
Loading Hazardous Debris			A	1	2	1.55	/CY	72,588	CY	1.300	1.000	1.000	Expansion		167,000	163,000
Transportation of Hazardous Waste On-post			A	1	2	1.07	/CY	72,588	CY	1.300	4.000	1.000	Expansion, Miles		461,000	450,000
On-post Hazardous Waste Landfill			A	1	2	4.07	/CY	72,588	CY	1.000	1.000	1.000			337,000	329,000
Backfill of Structure Excavation			A	1	2	8.05	/CY	32,687	CY	1.000	1.000	1.000			300,000	293,000
Restoration of Structure Excavation			A	1	2	0.08	/SF	32,687	CY	1.000	1.000	1.000			3,000	3,000
		Subtotal (I)													40,734,000	39,764,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	2	(52.61)	/TON	38,407	TON	1.000	1.000	1.000			(2,306,000)	(2,251,000)
		Subtotal (I')													(2,306,000)	(2,251,000)
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMLSST													
Mob/Demob	2.0%	J = 0.020 * (I)													815,000	795,000
Indirects, Overhead & Profit	37.8%	K = 0.378 * (I+J)													15,684,000	15,311,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	1.8%	M = 0.018 * (I+J+K)													1,002,000	978,000
Contingency	28.8%	N = 0.288 * (I+J+K+L+M)													16,742,000	16,344,000
		Subtotal (O = J+K+L+M+N)													34,243,000	33,428,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Hazardous Waste Landfill Closure			A	2	30	0.13	/CY	72,588	CY	1.000	1.000	1.000		11,000	312,000	163,000
		Subtotal (P)												11,000	312,000	163,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												4,000	122,000	64,000
Contingency	30.0%	R = 0.300 * (P+Q)												4,000	130,000	68,000
		Subtotal (S)												9,000	252,000	132,000
TOTAL O&M COSTS (T = I+I'+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														19,000	73,235,000	71,235,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															74,800,000	72,700,000

Table C-12 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 20: Dismantling, Salvage, Off-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Shredding Structure Debris			LS	1	--	0.31	/CY	78,394	CY	1.000	1.000	1.000			28,000	28,000
Transfer Station			LS	1	--	0.24	/CY	72,588	CY	1.000	1.000	1.000			20,000	20,000
		Subtotal (A)													48,000	48,000
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													2,000	2,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													19,000	19,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													2,000	2,000
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													1,000	1,000
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													18,000	18,000
		Subtotal (G =B+C+D+E+F)													42,000	42,000
DIRECT SUBCONTRACT CAPITAL COSTS																
0			0	0	--	0.00	0.00	10	0	1.000	1.000	1.000			0	0
		Subtotal (A1)													0	0
INDIRECT SUBCONTRACT CAPITAL COSTS		COST CODE:	0													
Mob/Demob	0.0%	B1 = 0.000 * (A1)													0	0
Contractor Markup	0.0%	C1 = 0.000 * (A1+B1)													0	0
Engineering Design	0.0%	D1 = 0.000 * (A1+B1+C1)													0	0
Resident Engineering	0.0%	E1 = 0.000 * (A1+B1+C1)													0	0
Contingency	0.0%	F1 = 0.000 * (A1+B1+C1+D1+E1)													0	0
		Subtotal (G1 = B1+C1+D1+E1+F1)													0	0
TOTAL CAPITAL COSTS (H = A+G)															90,000	90,000

Table C-12 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 20: Dismantling, Salvage, Off-Post Hazardous Waste Landfill

Cost Item	%	Cost Code	Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	631,646	CY	1.000	1.000	1.000			2,703,000	2,639,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	631,646	CY	1.000	1.000	1.000			3,136,000	3,061,000
Demolition			A	1	2	11.02	/CY	631,646	CY	1.000	1.000	1.000			7,943,000	7,754,000
Loading Hazardous Debris			A	1	2	1.55	/CY	78,394	CY	1.600	1.000	1.000	Expansion		222,000	217,000
Transportation of Hazardous Waste On-post			A	1	2	1.07	/CY	78,394	CY	1.600	4.000	1.000	Expansion, Miles		613,000	598,000
Shredding Structure Debris			A	1	2	13.32	/CY	78,394	CY	1.600	1.000	1.000	Expansion		1,907,000	1,861,000
Debris Sampling, Process/Agent, Haz Disposal			A	1	2	213.05	/CY	72,588	CY	1.300	1.000	1.000	Expansion		22,942,000	22,396,000
Loading Hazardous Debris			A	1	2	1.55	/CY	72,588	CY	1.300	1.000	1.000	Expansion		167,000	163,000
Transfer Station			A	1	2	0.41	/CY	72,588	CY	1.300	1.000	1.000	Expansion		44,000	43,000
Transportation of Hazardous Waste Off-post			A	1	2	0.19	/CY	72,588	CY	1.300	70.000	1.000	Expansion, Miles		1,432,000	1,398,000
Backfill of Structure Excavation			A	1	2	8.05	/CY	32,687	CY	1.000	1.000	1.000			300,000	293,000
Restoration of Structure Excavation			A	1	2	0.08	/SF	32,687	CY	1.000	1.000	1.000			3,000	3,000
Subtotal (I)															41,412,000	40,426,000
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMLSST													
Mob/Demob	2.0%	J = 0.020 * (I)													828,000	809,000
Indirects, Overhead & Profit	37.8%	K = 0.378 * (I+J)													15,946,000	15,566,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	1.8%	M = 0.018 * (I+J+K)													1,018,000	994,000
Contingency	28.8%	N = 0.288 * (I+J+K+L+M)													16,728,000	16,330,000
		Subtotal (O = J+K+L+M+N)													34,521,000	33,699,000
DIRECT SUBCONTRACT O&M COSTS (OPERATIONS)																
Off-post Hazardous Waste Landfill			A	1	2	76.00	/CY	72,588	CY	1.000	1.000	1.000			6,295,000	6,146,000
		Subtotal (I')													6,295,000	6,146,000
INDIRECT SUBCONTR. O&M COSTS (OPERATIONS)		COST CODE:	B													
Mob/Demob	0.0%	J' = 0.000 * (I')													0	0
Contractor Markup	6.0%	K' = 0.060 * (I'+J')													378,000	369,000
Engineering Design	0.0%	L' = 0.000 * (I'+J'+K')													0	0
Resident Engineering	0.0%	M' = 0.000 * (I'+J'+K')													0	0
Contingency	25.0%	N' = 0.250 * (I'+J'+K'+L'+M')													1,668,000	1,629,000
		Subtotal (O' = J'+K'+L'+M'+N')													2,046,000	1,997,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	2	(52.61)	/TON	38,407	TON	1.000	1.000	1.000			(2,305,813)	(2,250,913)
Subtotal (V)															(2,306,000)	(2,251,000)
TOTAL O&M COSTS (OPERATIONS) (P = I+I'+O+O'+V)															81,968,000	80,017,000

PH-20.WQ1
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Table C-12 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 20: Dismantling, Salvage, Off-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)														0	0	0
		Subtotal (Q)												0	0	0
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	0													
Indirects, Overhead & Profit	0.0%	R = 0.000 * (Q)												0	0	0
Contingency	0.0%	S = 0.000 * (Q+R)												0	0	0
		Subtotal (T)												0	0	0
TOTAL O&M COSTS (LONG-TERM ACTIVITIES) (U = Q+T)														0	0	0
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+P+U)															82,100,000	80,100,000

Table C-13 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 21: Dismantling, Clay Cap

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Shredding Structure Debris			LS	1	--	0.31	/CY	78,394	CY	1.000	1.000	1.000			28,000	28,000
		Subtotal (A)													28,000	28,000
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													1,000	1,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													11,000	11,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													1,000	1,000
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													0	0
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													11,000	11,000
		Subtotal (G =B+C+D+E+F)													25,000	25,000
TOTAL CAPITAL COSTS (H = A+G)															52,000	52,000

NPH-21.WQ1
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Table C-13 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 21: Dismantling, Clay Cap

Cost Item	Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)														
Dust & Safety Samp of Manuf Structures	A	1	2	3.75	/CY	631,646	CY	1.000	1.000	1.000			2,703,000	2,639,000
Repair of Manufacturing Structures	A	1	2	4.35	/CY	631,646	CY	1.000	1.000	1.000			3,136,000	3,061,000
Demolition	A	1	2	11.02	/CY	631,646	CY	1.000	1.000	1.000			7,943,000	7,754,000
Loading Nonhazardous Debris	A	1	2	1.28	/CY	78,394	CY	1.600	1.000	1.000	Expansion		183,000	179,000
Transportation of Nonhazardous Waste On-post	A	1	2	0.86	/CY	78,394	CY	1.600	4.000	1.000	Expansion, Miles		492,000	481,000
Shredding Structure Debris	A	1	2	13.32	/CY	78,394	CY	1.600	1.000	1.000	Expansion		1,907,000	1,861,000
Debris Sampling, Manufacturing, Consolidation	A	1	2	4.26	/CY	109,474	CY	1.300	1.000	1.000	Expansion		692,000	675,000
Loading Nonhazardous Debris	A	1	2	1.28	/CY	109,474	CY	1.300	1.000	1.000	Expansion		208,000	203,000
Transportation of Nonhazardous Waste On-post	A	1	2	0.86	/CY	109,474	CY	1.300	4.000	1.000	Expansion, Miles		559,000	545,000
Consolidation of Structural Material	A	1	2	7.26	/CY	94,822	CY	1.000	1.000	1.000			786,000	767,000
Clay Cap	A	1	2	2.06	/SF	173,117	SF	1.000	1.000	1.000			407,000	397,000
Vegetative Cover for Cap	A	1	2	0.38	/SF	173,117	SF	1.000	1.000	1.000			75,000	73,000
Subtotal (I)													19,090,000	18,636,000
DIRECT O&M REVENUES (OPERATIONS)														
Salvage of Metal	A	1	2	(52.61)	/TON	38,407	TON	1.000	1.000	1.000			(2,306,000)	(2,251,000)
Subtotal (I')													(2,306,000)	(2,251,000)
INDIRECT O&M COSTS (OPERATIONS) — COST CODE	MMMSST													
Mob/Demob 2.0% J = 0.020 * (I)													382,000	373,000
Indirects, Overhead & Profit 39.0% K = 0.390 * (I+J)													7,594,000	7,413,000
Engineering Design 0.0% L = 0.000 * (I+J+K)													0	0
Resident Engineering 1.8% M = 0.018 * (I+J+K)													474,000	462,000
Contingency 28.8% N = 0.288 * (I+J+K+L+M)													7,918,000	7,729,000
Subtotal (O = J+K+L+M+N)													16,367,000	15,977,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)														
Clay Cap	A	2	30	0.09	/SF	173,117	SF	1.000	1.000	1.000		18,000	516,000	269,000
Groundwater Monitoring	A	2	30	78,100.00	/YEAR	1	YR	1.000	1.000	1.000		89,000	2,585,000	1,349,000
5-Year Site Review	A	2	30	5,400.00	/YEAR	1	YR	1.000	1.000	1.000		6,000	179,000	93,000
Subtotal (P)												113,000	3,279,000	1,712,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES) — COST CODE	LLSL													
Indirects, Overhead & Profit 39.0% Q = 0.390 * (P)												44,000	1,279,000	668,000
Contingency 30.0% R = 0.300 * (P+Q)												47,000	1,367,000	714,000
Subtotal (S)												91,000	2,646,000	1,382,000
TOTAL O&M COSTS (T = I+I'+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]												204,000	39,077,000	35,456,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)													39,100,000	35,500,000

Table C-14 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 21A: Dismantling, Consolidation

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Shredding Structure Debris			LS	1	--	0.31	/CY	78,394	CY	1.000	1.000	1.000			28,000	28,000
		Subtotal (A)													28,000	28,000
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													1,000	1,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													11,000	11,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													1,000	1,000
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													0	0
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													11,000	11,000
		Subtotal (G =B+C+D+E+F)													25,000	25,000
TOTAL CAPITAL COSTS (H = A+G)															52,000	52,000

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Table C-14 Cost Estimate - No Future Use, Manufacturing History Medium Group - Process History Subgroup
Alternative No. 21A: Dismantling, Consolidation

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	631,646	CY	1.000	1.000	1.000			2,703,000	2,639,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	631,646	CY	1.000	1.000	1.000			3,136,000	3,061,000
Demolition			A	1	2	11.02	/CY	631,646	CY	1.000	1.000	1.000			7,943,000	7,754,000
Loading Nonhazardous Debris			A	1	2	1.28	/CY	78,394	CY	1.600	1.000	1.000	Expansion		183,000	179,000
Transportation of Nonhazardous Waste On-post			A	1	2	0.86	/CY	78,394	CY	1.600	4.000	1.000	Expansion, Miles		492,000	481,000
Shredding Structure Debris			A	1	2	13.32	/CY	78,394	CY	1.600	1.000	1.000	Expansion		1,907,000	1,861,000
Debris Sampling, Manufacturing, Consolidation			A	1	2	4.26	/CY	72,588	CY	1.300	1.000	1.000	Expansion		459,000	448,000
Loading Nonhazardous Debris			A	1	2	1.28	/CY	72,588	CY	1.300	1.000	1.000	Expansion		138,000	135,000
Transportation of Nonhazardous Waste On-post			A	1	2	0.86	/CY	72,588	CY	1.300	4.000	1.000	Expansion, Miles		370,000	362,000
Consolidation of Structural Material			A	1	2	7.26	/CY	72,588	CY	1.000	1.000	1.000			601,000	587,000
Backfill of Structure Excavation			A	1	2	8.05	/CY	32,687	CY	1.000	1.000	1.000			300,000	293,000
Restoration of Structure Excavation			A	1	2	0.08	/SF	32,687	CY	1.000	1.000	1.000			3,000	3,000
		Subtotal (I)													18,236,000	17,802,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	2	(52.61)	/TON	38,407	TON	1.000	1.000	1.000			(2,306,000)	(2,251,000)
		Subtotal (I')													(2,306,000)	(2,251,000)
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMMSST													
Mob/Demob	2.0%	J = 0.020 * (I)													365,000	356,000
Indirects, Overhead & Profit	39.0%	K = 0.390 * (I+J)													7,254,000	7,081,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	1.8%	M = 0.018 * (I+J+K)													452,000	442,000
Contingency	28.8%	N = 0.288 * (I+J+K+L+M)													7,563,000	7,383,000
		Subtotal (O = J+K+L+M+N)													15,635,000	15,262,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
		Subtotal (P)												0	0	0
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	0													
Indirects, Overhead & Profit	0.0%	Q = 0.000 * (P)												0	0	0
Contingency	0.0%	R = 0.000 * (P+Q)												0	0	0
		Subtotal (S)												0	0	0
TOTAL O&M COSTS (T = I+I'+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														0	31,565,000	30,813,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															31,600,000	30,900,000

Table C-15 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 1: No Action

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000			0	0
		Subtotal (A)													0	0
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													0	0
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													0	0
Engineering Design	3.0%	D = 0.030 * (A+B+C)													0	0
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													0	0
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													0	0
		Subtotal (G =B+C+D+E+F)													0	0
TOTAL CAPITAL COSTS (H = A+G)															0	0

Table C-15 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 1: No Action

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000			0	0
		Subtotal (I)													0	0
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	LLSS													
Mob/Demob	3.3%	J = 0.033 * (I)													0	0
Indirects, Overhead & Profit	39.0%	K = 0.390 * (I+J)													0	0
Engineering Design	3.0%	L = 0.030 * (I+J+K)													0	0
Resident Engineering	1.3%	M = 0.013 * (I+J+K)													0	0
Contingency	26.3%	N = 0.263 * (I+J+K+L+M)													0	0
		Subtotal (O = J+K+L+M+N)													0	0
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000		0	0	0
		Subtotal (P)												0	0	0
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSS													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												0	0	0
Contingency	26.3%	R = 0.263 * (P+Q)												0	0	0
		Subtotal (S)												0	0	0
TOTAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														0	0	0
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															0	0

Table C-16 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 2A: Locks/Boards/Fences/Signs

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Locks & Boards			LS	1	--	1.86	/SF	379,291	SF	1.000	1.000	1.000			805,000	805,000
Fences & Signs			LS	1	--	16.12	/LF	57,102	LF	1.000	1.000	1.000			1,050,000	1,050,000
		Subtotal (A)													1,855,000	1,855,000
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													60,000	60,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													747,000	747,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													80,000	80,000
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													33,000	33,000
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													729,000	729,000
		Subtotal (G =B+C+D+E+F)													1,649,000	1,649,000
TOTAL CAPITAL COSTS (H = A+G)															3,505,000	3,505,000

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Table C-16 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 2A: Locks/Boards/Fences/Signs

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
		Subtotal (I)													0	0
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	0													
Mob/Demob	0.0%	J = 0.000 * (I)													0	0
Indirects, Overhead & Profit	0.0%	K = 0.000 * (I+J)													0	0
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	0.0%	M = 0.000 * (I+J+K)													0	0
Contingency	0.0%	N = 0.000 * (I+J+K+L+M)													0	0
		Subtotal (O = J+K+L+M+N)													0	0
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
Locks & Boards			A	2	30	0.19	/SF	379,291	SF	1.000	1.000	1.000		82,000	2,385,000	1,245,000
Fences & Signs			A	2	30	1.61	/LF	57,102	LF	1.000	1.000	1.000		105,000	3,042,000	1,588,000
		Subtotal (P)												187,000	5,427,000	2,834,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												73,000	2,117,000	1,105,000
Contingency	30.0%	R = 0.300 * (P+Q)												78,000	2,263,000	1,182,000
		Subtotal (S)												151,000	4,380,000	2,287,000
TOTAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														338,000	9,807,000	5,120,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															13,300,000	8,630,000

Table C-17 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 19a: Dismantling, Salvage, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Shredding Structure Debris			LS	1	--	0.31	/CY	30,759	CY	1.000	1.000	1.000			11,000	11,000
On-post Nonhazardous Waste Landfill			LS	1	--	4.32	/CY	28,242	CY	1.000	1.000	1.000			139,000	139,000
On-post Nonhazardous Waste Landfill Closure			LS	2	--	3.70	/CY	28,242	CY	1.000	1.000	1.000			119,000	114,000
		Subtotal (A)													269,000	264,000
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													9,000	9,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													108,000	106,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													12,000	11,000
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													5,000	5,000
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													106,000	104,000
		Subtotal (G =B+C+D+E+F)													239,000	234,000
TOTAL CAPITAL COSTS (H = A+G)															509,000	498,000

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Table C-17 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 19a: Dismantling, Salvage, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	210,108	CY	1.000	1.000	1.000			899,000	878,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	210,108	CY	1.000	1.000	1.000			1,043,000	1,018,000
Demolition			A	1	2	11.02	/CY	210,108	CY	1.000	1.000	1.000			2,642,000	2,579,000
Loading Nonhazardous Debris			A	1	2	1.28	/CY	30,759	CY	1.600	1.000	1.000	Expansion		72,000	70,000
Transportation of Nonhazardous Waste On-post			A	1	2	0.86	/CY	30,759	CY	1.600	4.000	1.000	Expansion, Miles		193,000	189,000
Shredding Structure Debris			A	1	2	13.32	/CY	30,759	CY	1.600	1.000	1.000	Expansion		748,000	730,000
Debris Sampling, Nonprocess, Nonhaz Disposal			A	1	2	42.61	/CY	28,242	CY	1.300	1.000	1.000	Expansion		1,785,000	1,743,000
Loading Nonhazardous Debris			A	1	2	1.28	/CY	28,242	CY	1.300	1.000	1.000	Expansion		54,000	52,000
Transportation of Nonhazardous Waste On-post			A	1	2	0.86	/CY	28,242	CY	1.300	4.000	1.000	Expansion, Miles		144,000	141,000
On-post Nonhazardous Waste Landfill			A	1	2	4.07	/CY	28,242	CY	1.000	1.000	1.000			131,000	128,000
Backfill of Structure Excavation			A	1	2	8.05	/CY	15,101	CY	1.000	1.000	1.000			139,000	135,000
Restoration of Structure Excavation			A	1	2	0.08	/SF	15,101	CY	1.000	1.000	1.000			1,000	1,000
Subtotal (I)															7,852,000	7,665,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	2	(52.61)	/TON	16,650	TON	1.000	1.000	1.000			(1,000,000)	(976,000)
Subtotal (I')															(1,000,000)	(976,000)
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMMSST													
Mob/Demob	2.0%	J = 0.020 * (I)													157,000	153,000
Indirects, Overhead & Profit	39.0%	K = 0.390 * (I+J)													3,123,000	3,049,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	1.8%	M = 0.018 * (I+J+K)													195,000	190,000
Contingency	28.8%	N = 0.288 * (I+J+K+L+M)													3,257,000	3,179,000
		Subtotal (O = J+K+L+M+N)													6,732,000	6,572,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Nonhazardous Waste Landfill Closure			A	2	30	0.13	/CY	28,242	CY	1.000	1.000	1.000		4,000	122,000	63,000
Subtotal (P)														4,000	122,000	63,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												2,000	47,000	25,000
Contingency	30.0%	R = 0.300 * (P+Q)												2,000	51,000	26,000
Subtotal (S)														3,000	98,000	51,000
TOTAL O&M COSTS (T = I+I'+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														8,000	13,804,000	13,375,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															14,300,000	13,900,000

Table C-18 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 20a: Dismantling, Salvage, Off-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Shredding Structure Debris			LS	1	--	0.31	/CY	30,759	CY	1.000	1.000	1.000			11,000	11,000
Transfer Station			LS	1	--	0.24	/CY	28,242	CY	1.000	1.000	1.000			8,000	8,000
		Subtotal (A)													19,000	19,000
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													1,000	1,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													7,000	7,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													1,000	1,000
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													0	0
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													7,000	7,000
		Subtotal (G =B+C+D+E+F)													16,000	16,000
DIRECT SUBCONTRACT CAPITAL COSTS															0	0
		Subtotal (A1)													0	0
INDIRECT SUBCONTRACT CAPITAL COSTS		COST CODE:	0													
Mob/Demob	0.0%	B1 = 0.000 * (A1)													0	0
Contractor Markup	0.0%	C1 = 0.000 * (A1+B1)													0	0
Engineering Design	0.0%	D1 = 0.000 * (A1+B1+C1)													0	0
Resident Engineering	0.0%	E1 = 0.000 * (A1+B1+C1)													0	0
Contingency	0.0%	F1 = 0.000 * (A1+B1+C1+D1+E1)													0	0
		Subtotal (G1 = B1+C1+D1+E1+F1)													0	0
TOTAL CAPITAL COSTS (H = A+G)															35,000	35,000

Table C-18 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 20a: Dismantling, Salvage, Off-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	210,108	CY	1.000	1.000	1.000			899,000	878,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	210,108	CY	1.000	1.000	1.000			1,043,000	1,018,000
Demolition			A	1	2	11.02	/CY	210,108	CY	1.000	1.000	1.000			2,642,000	2,579,000
Loading Nonhazardous Debris			A	1	2	1.28	/CY	30,759	CY	1.600	1.000	1.000	Expansion		72,000	70,000
Transportation of Nonhazardous Waste On-post			A	1	2	0.86	/CY	30,759	CY	1.600	4.000	1.000	Expansion, Miles		193,000	189,000
Shredding Structure Debris			A	1	2	13.32	/CY	30,759	CY	1.600	1.000	1.000	Expansion		748,000	730,000
Debris Sampling, Nonprocess, Nonhaz Disposal			A	1	2	42.61	/CY	28,242	CY	1.300	1.000	1.000	Expansion		1,785,000	1,743,000
Loading Nonhazardous Debris			A	1	2	1.28	/CY	28,242	CY	1.300	1.000	1.000	Expansion		54,000	52,000
Transfer Station			A	1	2	0.41	/CY	28,242	CY	1.300	1.000	1.000	Expansion		17,000	17,000
Transportation of Nonhazardous Waste Off-post			A	1	2	0.13	/CY	28,242	CY	1.300	10.000	1.000	Expansion, Miles		54,000	53,000
Backfill of Structure Excavation			A	1	2	8.05	/CY	15,101	CY	1.000	1.000	1.000			139,000	135,000
Restoration of Structure Excavation			A	1	2	0.08	/SF	15,101	CY	1.000	1.000	1.000			1,000	1,000
		Subtotal (I)													7,648,000	7,466,000
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMMSST													
Mob/Demob	2.0%	J = 0.020 * (I)													153,000	149,000
Indirects, Overhead & Profit	39.0%	K = 0.390 * (I+J)													3,042,000	2,970,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	1.8%	M = 0.018 * (I+J+K)													190,000	185,000
Contingency	28.8%	N = 0.288 * (I+J+K+L+M)													3,118,000	3,043,000
		Subtotal (O = J+K+L+M+N)													6,503,000	6,348,000
DIRECT SUBCONTRACT O&M COSTS (OPERATIONS)																
Off-post Nonhazardous Waste Landfill			A	1	2	4.50	/CY	28,242	CY	1.000	1.000	1.000			145,000	142,000
		Subtotal (I')													145,000	142,000
INDIRECT SUBCONTR. O&M COSTS (OPERATIONS)		COST CODE:	B													
Mob/Demob	0.0%	J' = 0.000 * (I')													0	0
Contractor Markup	6.0%	K' = 0.060 * (I'+J')													9,000	8,000
Engineering Design	0.0%	L' = 0.000 * (I'+J'+K')													0	0
Resident Engineering	0.0%	M' = 0.000 * (I'+J'+K')													0	0
Contingency	25.0%	N' = 0.250 * (I'+J'+K'+L'+M')													38,000	38,000
		Subtotal (O' = J'+K'+L'+M'+N')													47,000	46,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	2	(52.61)	/TON	16,650	TON	1.000	1.000	1.000			(1,000,000)	(976,000)
		Subtotal (V)													(1,000,000)	(976,000)
TOTAL O&M COSTS (OPERATIONS) (P = I+I'+O+O'+V)															13,343,000	13,026,000

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30-Dec-1899

Table C-18 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 20a: Dismantling, Salvage, Off-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
														0	0	0
		Subtotal (Q)												0	0	0
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	0													
Indirects, Overhead & Profit	0.0%	R = 0.000 * (Q)												0	0	0
Contingency	0.0%	S = 0.000 * (Q+R)												0	0	0
		Subtotal (T)												0	0	0
TOTAL O&M COSTS (LONG-TERM ACTIVITIES) (U = Q+T)														0	0	0
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+P+U)															13,400,000	13,100,000

Table C-19 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 21: Dismantling, Salvage, Clay Cap

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Shredding Structure Debris			LS	1	--	0.31	/CY	30,759	CY	1.000	1.000	1.000			11,000	11,000
		Subtotal (A)													11,000	11,000
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													0	0
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													4,000	4,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													0	0
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													0	0
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													4,000	4,000
		Subtotal (G =B+C+D+E+F)													10,000	10,000
TOTAL CAPITAL COSTS (H = A+G)															21,000	21,000

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Table C-19 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 21: Dismantling, Salvage, Clay Cap

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	210,108	CY	1.000	1.000	1.000			899,000	878,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	210,108	CY	1.000	1.000	1.000			1,043,000	1,018,000
Demolition			A	1	2	11.02	/CY	210,108	CY	1.000	1.000	1.000			2,642,000	2,579,000
Loading Nonhazardous Debris			A	1	2	1.28	/CY	30,759	CY	1.600	1.000	1.000	Expansion		72,000	70,000
Transportation of Nonhazardous Waste On-post			A	1	2	0.86	/CY	30,759	CY	1.600	4.000	1.000	Expansion, Miles		193,000	189,000
Shredding Structure Debris			A	1	2	13.32	/CY	30,759	CY	1.600	1.000	1.000	Expansion		748,000	730,000
Debris Sampling, Manufacturing, Consolidation			A	1	2	4.26	/CY	31,834	CY	1.300	1.000	1.000	Expansion		201,000	196,000
Loading Nonhazardous Debris			A	1	2	1.28	/CY	31,834	CY	1.300	1.000	1.000	Expansion		60,000	59,000
Transportation of Nonhazardous Waste On-post			A	1	2	0.86	/CY	31,834	CY	1.300	4.000	1.000	Expansion, Miles		162,000	159,000
Consolidation of Structural Material			A	1	2	7.26	/CY	25,181	CY	1.000	1.000	1.000			209,000	204,000
Clay Cap			A	1	2	2.06	/SF	77,827	SF	1.000	1.000	1.000			183,000	179,000
Vegetative Cover for Cap			A	1	2	0.38	/SF	77,827	SF	1.000	1.000	1.000			34,000	33,000
Subtotal (I)															6,447,000	6,293,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	2	(52.61)	/TON	16,650	TON	1.000	1.000	1.000			(1,000,000)	(976,000)
Subtotal (I')															(1,000,000)	(976,000)
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMMSST													
Mob/Demob	2.0%	J = 0.020 * (I)													129,000	126,000
Indirects, Overhead & Profit	39.0%	K = 0.390 * (I+J)													2,565,000	2,504,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	1.8%	M = 0.018 * (I+J+K)													160,000	156,000
Contingency	28.8%	N = 0.288 * (I+J+K+L+M)													2,674,000	2,610,000
		Subtotal (O = J+K+L+M+N)													5,527,000	5,396,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
Clay Cap			A	2	30	0.09	/SF	77,827	SF	1.000	1.000	1.000		8,000	232,000	121,000
Groundwater Monitoring			A	2	30	78,100.00	/YEAR	1	YR	1.000	1.000	1.000		89,000	2,585,000	1,349,000
5-Year Site Review			A	2	30	5,400.00	/YEAR	1	YR	1.000	1.000	1.000		6,000	179,000	93,000
Subtotal (P)														103,000	2,995,000	1,564,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												40,000	1,168,000	610,000
Contingency	30.0%	R = 0.300 * (P+Q)												43,000	1,249,000	652,000
Subtotal (S)														83,000	2,417,000	1,262,000
TOTAL O&M COSTS (T = I+I'+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														187,000	16,387,000	13,539,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															16,400,000	13,600,000

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Table C-20 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 21A: Dismantling, Salvage, Consolidation

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Shredding Structure Debris			LS	1	--	0.31	/CY	30,759	CY	1.000	1.000	1.000			11,000	11,000
		Subtotal (A)													11,000	11,000
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													0	0
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													4,000	4,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													0	0
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													0	0
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													4,000	4,000
		Subtotal (G =B+C+D+E+F)													10,000	10,000
TOTAL CAPITAL COSTS (H = A+G)															21,000	21,000

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Table C-20 Cost Estimate - No Future Use, Manufacturing History Medium Group - Nonprocess History Subgroup
Alternative No. 21A: Dismantling, Salvage, Consolidation

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Dust & Safety Samp of Manuf Structures			A	1	2	3.75	/CY	210,108	CY	1.000	1.000	1.000			899,000	878,000
Repair of Manufacturing Structures			A	1	2	4.35	/CY	210,108	CY	1.000	1.000	1.000			1,043,000	1,018,000
Demolition			A	1	2	11.02	/CY	210,108	CY	1.000	1.000	1.000			2,642,000	2,579,000
Loading Nonhazardous Debris			A	1	2	1.28	/CY	30,759	CY	1.600	1.000	1.000	Expansion		72,000	70,000
Transportation of Nonhazardous Waste On-post			A	1	2	0.86	/CY	30,759	CY	1.600	4.000	1.000	Expansion, Miles		193,000	189,000
Shredding Structure Debris			A	1	2	13.32	/CY	30,759	CY	1.600	1.000	1.000	Expansion		748,000	730,000
Debris Sampling, Manufacturing, Consolidation			A	1	2	4.26	/CY	28,242	CY	1.300	1.000	1.000	Expansion		178,000	174,000
Loading Nonhazardous Debris			A	1	2	1.28	/CY	28,242	CY	1.300	1.000	1.000	Expansion		54,000	52,000
Transportation of Nonhazardous Waste On-post			A	1	2	0.86	/CY	28,242	CY	1.300	4.000	1.000	Expansion, Miles		144,000	141,000
Consolidation of Structural Material			A	1	2	7.26	/CY	28,242	CY	1.000	1.000	1.000			234,000	228,000
Backfill of Structure Excavation			A	1	2	8.05	/CY	15,101	CY	1.000	1.000	1.000			139,000	135,000
Restoration of Structure Excavation			A	1	2	0.08	/SF	15,101	CY	1.000	1.000	1.000			1,000	1,000
		Subtotal (I)													6,348,000	6,197,000
DIRECT O&M REVENUES (OPERATIONS)																
Salvage of Metal			A	1	2	(52.61)	/TON	16,650	TON	1.000	1.000	1.000			(1,000,000)	(976,000)
		Subtotal (I')													(1,000,000)	(976,000)
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	MMMSST													
Mob/Demob	2.0%	J = 0.020 * (I)													127,000	124,000
Indirects, Overhead & Profit	39.0%	K = 0.390 * (I+J)													2,525,000	2,465,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	1.8%	M = 0.018 * (I+J+K)													157,000	154,000
Contingency	28.8%	N = 0.288 * (I+J+K+L+M)													2,633,000	2,570,000
		Subtotal (O = J+K+L+M+N)													5,442,000	5,313,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
		Subtotal (P)												0	0	0
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	0													
Indirects, Overhead & Profit	0.0%	Q = 0.000 * (P)												0	0	0
Contingency	0.0%	R = 0.000 * (P+Q)												0	0	0
		Subtotal (S)												0	0	0
TOTAL O&M COSTS (T = I+I'+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														0	10,791,000	10,534,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															10,800,000	10,600,000

Table C-21 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 1: No Action

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000			0	0
		Subtotal (A)													0	0
INDIRECT CAPITAL COSTS		COST CODE	Z													
Mob/Demob	0.0%	B = 0.000 * (A)													0	0
Indirects, Overhead & Profit	0.0%	C = 0.000 * (A+B)													0	0
Engineering Design	0.0%	D = 0.000 * (A+B+C)													0	0
Resident Engineering	0.0%	E = 0.000 * (A+B+C)													0	0
Contingency	0.0%	F = 0.000 * (A+B+C+D+E)													0	0
		Subtotal (G =B+C+D+E+F)													0	0
TOTAL CAPITAL COSTS (H = A+G)															0	0

Table C-21 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 1: No Action

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000			0	0
		Subtotal (I)													0	0
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	Z													
Mob/Demob	0.0%	J = 0.000 * (I)													0	0
Indirects, Overhead & Profit	0.0%	K = 0.000 * (I+J)													0	0
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	0.0%	M = 0.000 * (I+J+K)													0	0
Contingency	0.0%	N = 0.000 * (I+J+K+L+M)													0	0
		Subtotal (O = J+K+L+M+N)													0	0
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
No Action			0	0	--	0.00	/EA	1	EA	1.000	1.000	1.000		0	0	0
		Subtotal (P)												0	0	0
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	Z													
Indirects, Overhead & Profit	0.0%	Q = 0.000 * (P)												0	0	0
Contingency	0.0%	R = 0.000 * (P+Q)												0	0	0
		Subtotal (S)												0	0	0
TOTAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														0	0	0
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															0	0

Table C-22 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 4: Hot Gas, Dismantling, On-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
Hot Gas for Agent Structures			LS	1	--	0.81	/SF	1,667,905	SF	1.000	1.000	1.000			1,542,000	1,542,000
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
On-post Hazardous Waste Landfill			LS	1	--	5.72	/CY	72,777	CY	1.000	1.000	1.000			475,000	475,000
On-post Hazardous Waste Landfill Closure			LS	3	--	3.80	/CY	72,777	CY	1.000	1.000	1.000			316,000	286,000
		Subtotal (A)													2,903,000	2,874,000
INDIRECT CAPITAL COSTS		COST CODE	LHSS													
Mob/Demob	4.5%	B = 0.045 * (A)													131,000	129,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													1,183,000	1,171,000
Engineering Design	6.5%	D = 0.065 * (A+B+C)													274,000	271,000
Resident Engineering	1.8%	E = 0.018 * (A+B+C)													74,000	73,000
Contingency	30.0%	F = 0.300 * (A+B+C+D+E)													1,369,000	1,356,000
		Subtotal (G = B+C+D+E+F)													3,031,000	3,000,000
TOTAL CAPITAL COSTS (H = A+G)															5,934,000	5,874,000

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Table C-22 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 4: Hot Gas, Dismantling, On-Post Hazardous Waste Landfill

Cost Item	Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)														
Agent Monitoring	A	1	2	22.53	/CY	72,777	CY	1.000	1.000	1.000			1,871,000	1,827,000
Repair of Agent Structures	A	1	3	5.28	/CY	573,624	CY	1.000	1.000	1.000			3,456,000	3,294,000
Hot Gas for Agent Structures	A	1	3	15.96	/SF	1,667,905	SF	1.000	1.000	1.000			30,378,000	28,954,000
Agent Monitoring	A	1	3	22.53	/CY	72,777	CY	1.000	1.000	1.000			1,871,000	1,783,000
Air Sampling	A	1	3	2,940,789.00	/YR	3	YR	1.000	1.000	1.000			10,068,000	9,596,000
Demolition of Agent Structures	A	1	3	23.31	/CY	573,624	CY	1.000	1.000	1.000			15,259,000	14,544,000
Loading Hazardous Debris	A	1	3	1.55	/CY	72,777	CY	1.600	1.000	1.000	Expansion		206,000	196,000
Agent Monitoring	A	1	3	22.53	/CY	72,777	CY	1.600	1.000	1.000	Expansion		2,994,000	2,854,000
Debris Sampling, Process/Agent, Haz Disposal	A	1	3	213.05	/CY	72,777	CY	1.600	1.000	1.000	Expansion		28,310,000	26,984,000
Transportation of Hazardous Waste On-post	A	1	3	1.07	/CY	72,777	CY	1.600	4.000	1.000	Expansion, Miles		569,000	542,000
On-post Hazardous Waste Landfill	A	1	3	4.07	/CY	72,777	CY	1.000	1.000	1.000			338,000	322,000
Backfill of Structure Excavation	A	1	3	8.05	/CY	18,978	CY	1.000	1.000	1.000			174,000	166,000
Restoration of Structure Excavation	A	1	3	0.08	/SF	18,978	CY	1.000	1.000	1.000			2,000	2,000
Subtotal (I)													95,496,000	91,063,000
INDIRECT O&M COSTS (OPERATIONS) COST CODE HMLMST														
Mob/Demob 2.0% J = 0.020 * (I)													1,910,000	1,821,000
Indirects, Overhead & Profit 39.0% K = 0.390 * (I+J)													37,988,000	36,225,000
Engineering Design 0.0% L = 0.000 * (I+J+K)													0	0
Resident Engineering 2.3% M = 0.023 * (I+J+K)													3,046,000	2,905,000
Contingency 32.5% N = 0.325 * (I+J+K+L+M)													44,993,000	42,905,000
Subtotal (O = J+K+L+M+N)													87,937,000	83,856,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)														
On-post Hazardous Waste Landfill Closure	A	2	30	0.13	/CY	72,777	CY	1.000	1.000	1.000		11,000	313,000	163,000
Subtotal (P)												11,000	313,000	163,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES) COST CODE LLSL														
Indirects, Overhead & Profit 39.0% Q = 0.390 * (P)												4,000	122,000	64,000
Contingency 30.0% R = 0.300 * (P+Q)												5,000	131,000	68,000
Subtotal (S)												9,000	253,000	132,000
TOTAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]												20,000	183,999,000	175,215,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)													190,000,000	181,000,000

Table C-23 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 6: Hot Gas, Dismantling, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
Hot Gas for Agent Structures			LS	4	--	0.81	/SF	1,667,905	SF	1.000	1.000	1.000			1,542,000	1,332,000
Agent Monitoring			LS	4	--	2.29	/CY	72,777	CY	1.300	1.000	1.000	Expansion		247,000	214,000
Agent Monitoring			LS	4	--	2.29	/CY	72,777	CY	1.300	1.000	1.000	Expansion		247,000	214,000
On-post Nonhazardous Waste Landfill			LS	6	--	4.32	/CY	72,777	CY	0.700	1.000	1.000	Reduction		251,000	197,000
On-post Nonhazardous Waste Landfill Closure			LS	7	--	3.70	/CY	72,777	CY	0.700	1.000	1.000	Reduction		215,000	161,000
		Subtotal (A)													2,693,000	2,306,000
INDIRECT CAPITAL COSTS		COST CODE	LHMS													
Mob/Demob	4.5%	B = 0.045 * (A)													121,000	104,000
Indirects, Overhead & Profit	37.8%	C = 0.378 * (A+B)													1,062,000	910,000
Engineering Design	6.5%	D = 0.065 * (A+B+C)													252,000	216,000
Resident Engineering	1.8%	E = 0.018 * (A+B+C)													72,000	62,000
Contingency	30.0%	F = 0.300 * (A+B+C+D+E)													1,238,000	1,061,000
		Subtotal (G =B+C+D+E+F)													2,746,000	2,352,000
DIRECT SUBCONTRACT CAPITAL COSTS																
On-post Rotary Kiln Incineration			LS	6	--	36.37	/CY	72,777	CY	1.000	1.000	1.000			3,021,000	2,367,000
		Subtotal (A1)													3,021,000	2,367,000
INDIRECT SUBCONTRACT CAPITAL COSTS		COST CODE: C														
Mob/Demob	2.0%	B1 = 0.020 * (A1)													60,000	47,000
Contractor Markup	10.0%	C1 = 0.100 * (A1+B1)													308,000	241,000
Engineering Design	9.0%	D1 = 0.090 * (A1+B1+C1)													305,000	239,000
Resident Engineering	3.0%	E1 = 0.030 * (A1+B1+C1)													102,000	80,000
Contingency	30.0%	F1 = 0.300 * (A1+B1+C1+D1+E1)													1,139,000	892,000
		Subtotal (G1 = B1+C1+D1+E1+F1)													1,914,000	1,500,000
TOTAL CAPITAL COSTS (H = A+G)															10,373,000	8,525,000

Table C-23 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 6: Hot Gas, Dismantling, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Agent Monitoring			A	1	2	22.53	/CY	72,777	CY	1.000	1.000	1.000			1,871,000	1,827,000
Repair of Agent Structures			A	1	3	5.28	/CY	573,624	CY	1.000	1.000	1.000			3,456,000	3,294,000
Hot Gas for Agent Structures			A	4	6	15.96	/SF	1,667,905	SF	1.000	1.000	1.000			30,378,000	25,012,000
Agent Monitoring			A	1	2	22.53	/CY	72,777	CY	1.000	1.000	1.000			1,871,000	1,827,000
Air Sampling			A	4	6	2,940,789.00	/YR	3	YR	1.000	1.000	1.000			10,068,000	8,289,000
Demolition of Agent Structures			A	4	6	23.31	/CY	573,624	CY	1.000	1.000	1.000			15,259,000	12,563,000
Loading Nonhazardous Debris			A	6	7	1.28	/CY	72,777	CY	1.600	1.000	1.000	Expansion		170,000	130,000
Agent Monitoring			A	4	6	22.53	/CY	72,777	CY	1.600	1.000	1.000	Expansion		2,994,000	2,465,000
Debris Sampling, Process/Agent, Haz Disposal			A	6	7	213.05	/CY	72,777	CY	1.600	1.000	1.000	Expansion		28,310,000	21,654,000
Transportation of Hazardous Waste On-post			A	6	7	1.07	/CY	72,777	CY	1.600	4.000	1.000	Expansion, Miles		569,000	435,000
Debris Sampling, Process/Agent, Haz Disposal			A	6	7	213.05	/CY	72,777	CY	1.600	1.000	1.000	Expansion		28,310,000	21,654,000
Loading Nonhazardous Debris			A	6	7	1.28	/CY	72,777	CY	1.300	1.000	1.000	Reduction		138,000	106,000
Transportation of Nonhazardous Waste On-post			A	6	7	0.86	/CY	72,777	CY	1.300	1.000	1.000	Reduction		93,000	71,000
On-post Nonhazardous Waste Landfill			A	6	7	4.07	/CY	72,777	CY	1.300	4.000	1.000	Reduction, Miles		1,758,000	1,344,000
Backfill of Structure Excavation			A	4	6	8.05	/CY	18,978	CY	1.000	1.000	1.000	Reduction		174,000	144,000
Restoration of Structure Excavation			A	4	6	0.08	/SF	18,978	CY	1.000	1.000	1.000			2,000	1,000
Subtotal (I)															125,421,000	100,815,000
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	HMLMST													
Mob/Demob	2.0%	J = 0.020 * (I)													2,508,000	2,016,000
Indirects, Overhead & Profit	39.0%	K = 0.390 * (I+J)													49,892,000	40,104,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	2.3%	M = 0.023 * (I+J+K)													4,001,000	3,216,000
Contingency	32.5%	N = 0.325 * (I+J+K+L+M)													57,792,000	46,454,000
		Subtotal (O = J+K+L+M+N)													114,194,000	91,791,000
DIRECT SUBCONTRACT O&M COSTS (OPERATIONS)																
On-post Rotary Kiln Incineration			A	6	7	144.36	/CY	72,777	CY	1.000	1.000	1.000			11,989,000	9,170,000
		Subtotal (I')													11,989,000	9,170,000
INDIRECT SUBCONTR. O&M COSTS (OPERATIONS)		COST CODE:	D													
Mob/Demob	0.0%	J' = 0.000 * (I')													0	0
Contractor Markup	10.0%	K' = 0.100 * (I'+J')													1,199,000	917,000
Engineering Design	0.0%	L' = 0.000 * (I'+J'+K')													0	0
Resident Engineering	2.0%	M' = 0.020 * (I'+J'+K')													264,000	202,000
Contingency	40.0%	N' = 0.400 * (I'+J'+K'+L'+M')													5,381,000	4,116,000
		Subtotal (O' = J'+K'+L'+M'+N')													6,843,000	5,234,000
DIRECT O&M REVENUES (OPERATIONS)															0	0
Subtotal (V)															0	0
TOTAL O&M COSTS (OPERATIONS) (P = I+I'+O+O'+V)															258,447,000	207,011,000

Table C-23 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 6: Hot Gas, Dismantling, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Nonhazardous Waste Landfill Closure			A	7	30	0.13	/CY	72,777	CY	1.000	1.000	1.000		11,000	259,000	117,000
		Subtotal (Q)												11,000	259,000	117,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	R = 0.390 * (Q)												4,000	101,000	46,000
Contingency	30.0%	S = 0.300 * (Q+R)												5,000	108,000	49,000
		Subtotal (T)												9,000	209,000	94,000
TOTAL O&M COSTS (LONG-TERM ACTIVITIES) (U = Q+T)														20,000	468,000	211,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+P+U)															269,000,000	216,000,000

Table C-24 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 14: Dismantling, On-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
On-post Nonhazardous Waste Landfill			LS	1	--	4.32	/CY	72,777	CY	1.000	1.000	1.000			359,000	359,000
On-post Nonhazardous Waste Landfill Closure			LS	2	--	3.70	/CY	72,777	CY	1.000	1.000	1.000			307,000	293,000
		Subtotal (A)													1,046,000	1,032,000
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													34,000	34,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													421,000	415,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													45,000	44,000
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													19,000	19,000
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													411,000	405,000
		Subtotal (G =B+C+D+E+F)													930,000	917,000
TOTAL CAPITAL COSTS (H = A+G)															1,977,000	1,949,000

ible C-24 Cost Estimate - No Future Use, Agent History Medium Group

Alternative No. 14: Dismantling, On-Post Hazardous Waste Landfill

st Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
RECT O&M COSTS (OPERATIONS)																
Agent Monitoring			A	1	2	22.53	/CY	72,777	CY	1.000	1.000	1.000			1,871,000	1,827,000
Repair of Agent Structures			A	1	2	5.28	/CY	573,624	CY	1.000	1.000	1.000			3,456,000	3,374,000
Air Sampling			A	1	2	2,940,789.00	/YR	2	YR	1.000	1.000	1.000			6,712,000	6,552,000
Demolition of Agent Structures			A	1	2	23.31	/CY	573,624	CY	1.000	1.000	1.000			15,259,000	14,895,000
Loading Hazardous Debris			A	1	2	1.55	/CY	72,777	CY	1.600	1.000	1.000	Expansion		206,000	201,000
Agent Monitoring			A	1	2	22.53	/CY	72,777	CY	1.600	1.000	1.000	Expansion		2,994,000	2,923,000
Debris Sampling, Process/Agent, Haz Disposal			A	1	2	213.05	/CY	72,777	CY	1.600	1.000	1.000	Expansion		28,310,000	27,636,000
Transportation of Hazardous Waste On-post			A	1	2	1.07	/CY	72,777	CY	1.600	4.000	1.000	Expansion, Miles		569,000	555,000
On-post Hazardous Waste Landfill			A	1	2	4.07	/CY	72,777	CY	1.000	1.000	1.000			338,000	330,000
Backfill of Structure Excavation			A	1	2	8.05	/CY	18,978	CY	1.000	1.000	1.000			174,000	170,000
Restoration of Structure Excavation			A	1	2	0.08	/SF	18,978	CY	1.000	1.000	1.000			2,000	2,000
		Subtotal (I)													59,891,000	58,465,000
DIRECT O&M COSTS (OPERATIONS)		COST CODE	HMLSST													
Mob/Demob	2.0%	J = 0.020 * (I)													1,198,000	1,169,000
Indirects, Overhead & Profit	39.0%	K = 0.390 * (I+J)													23,825,000	23,257,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	2.0%	M = 0.020 * (I+J+K)													1,698,000	1,658,000
Contingency	31.3%	N = 0.313 * (I+J+K+L+M)													27,066,000	26,422,000
		Subtotal (O = J+K+L+M+N)													53,787,000	52,506,000
RECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Hazardous Waste Landfill Closure			A	2	30	0.13	/CY	72,777	CY	1.000	1.000	1.000		11,000	313,000	163,000
		Subtotal (P)												11,000	313,000	163,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												4,000	122,000	64,000
Contingency	30.0%	R = 0.300 * (P+Q)												5,000	131,000	68,000
		Subtotal (S)												9,000	253,000	132,000
TAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														20,000	114,243,000	111,267,000
TAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															116,000,000	113,000,000

Table C-25 Cost Estimate - No Future Use, Agent History Medium Group

Alternative No. 15: Dismantling, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
On-post Hazardous Waste Landfill			LS	4	--	5.72	/CY	72,777	CY	0.700	1.000	1.000	Reduction		333,000	287,000
On-post Hazardous Waste Landfill Closure			LS	7	--	3.80	/CY	72,777	CY	0.700	1.000	1.000	Reduction		221,000	165,000
		Subtotal (A)													934,000	832,000
INDIRECT CAPITAL COSTS		COST CODE	LLSS													
Mob/Demob	3.3%	B = 0.033 * (A)													30,000	27,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													376,000	335,000
Engineering Design	3.0%	D = 0.030 * (A+B+C)													40,000	36,000
Resident Engineering	1.3%	E = 0.013 * (A+B+C)													17,000	15,000
Contingency	26.3%	F = 0.263 * (A+B+C+D+E)													362,000	323,000
		Subtotal (G =B+C+D+E+F)													826,000	737,000
DIRECT SUBCONTRACT CAPITAL COSTS																
On-post Rotary Kiln Incineration			LS	4	--	36.37	/CY	72,777	CY	1.300	1.000	1.000	Expansion		3,927,000	3,392,000
		Subtotal (A1)													3,927,000	3,392,000
INDIRECT SUBCONTRACT CAPITAL COSTS		COST CODE:	C													
Mob/Demob	2.0%	B1 = 0.020 * (A1)													79,000	68,000
Contractor Markup	10.0%	C1 = 0.100 * (A1+B1)													401,000	346,000
Engineering Design	4.6%	D1 = 0.046 * (A1+B1+C1)													201,000	174,000
Resident Engineering	3.0%	E1 = 0.030 * (A1+B1+C1)													132,000	114,000
Contingency	1.1%	F1 = 0.011 * (A1+B1+C1+D1+E1)													52,000	45,000
		Subtotal (G1 = B1+C1+D1+E1+F1)													864,000	747,000
TOTAL CAPITAL COSTS (H = A+G)															6,551,000	5,708,000

Table C-25 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 15: Dismantling, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill

Cost Item	Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)														
Agent Monitoring	A	1	2	22.53	/CY	72,777	CY	1.000	1.000	1.000			1,871,000	1,827,000
Repair of Agent Structures	A	4	6	5.28	/CY	573,624	CY	1.000	1.000	1.000			3,456,000	2,846,000
Air Sampling	A	4	6	2,940,789.00	/YR	3	YR	1.000	1.000	1.000			10,068,000	8,289,000
Demolition of Agent Structures	A	4	6	23.31	/CY	573,624	CY	1.000	1.000	1.000			15,259,000	12,563,000
Loading Hazardous Debris	A	4	7	1.55	/CY	72,777	CY	1.600	1.000	1.000	Expansion		206,000	166,000
Agent Monitoring	A	1	2	22.53	/CY	72,777	CY	1.000	1.000	1.000			1,871,000	1,827,000
Debris Sampling, Process/Agent, Haz Disposal	A	4	7	213.05	/CY	72,777	CY	1.600	1.000	1.000	Expansion		28,310,000	22,763,000
Transportation of Hazardous Waste On-post	A	4	7	1.07	/CY	72,777	CY	1.600	4.000	1.000	Expansion, Miles		569,000	457,000
Debris Sampling, Process/Agent, Haz Disposal	A	4	7	213.05	/CY	72,777	CY	1.600	1.000	1.000	Expansion		28,310,000	22,763,000
Loading Hazardous Debris	A	4	7	1.55	/CY	72,777	CY	1.600	1.000	1.000	Expansion		206,000	166,000
Transportation of Nonhazardous Waste On-post	A	4	7	0.86	/CY	72,777	CY	1.000	4.000	1.000	Reduction, Miles		286,000	230,000
On-post Nonhazardous Waste Landfill	A	4	7	4.07	/CY	72,777	CY	0.700	1.000	1.000	Reduction		237,000	190,000
Backfill of Structure Excavation	A	4	6	8.05	/CY	18,978	CY	1.000	1.000	1.000			174,000	144,000
Restoration of Structure Excavation	A	4	6	0.08	/SF	18,978	CY	1.000	1.000	1.000			2,000	1,000
Subtotal (I)													90,825,000	74,232,000
INDIRECT O&M COSTS (OPERATIONS) — COST CODE HMMMST														
Mob/Demob 2.0% J = 0.020 * (I)													1,816,000	1,485,000
Indirects, Overhead & Profit 40.3% K = 0.403 * (I+J)													37,288,000	30,476,000
Engineering Design 0.0% L = 0.000 * (I+J+K)													0	0
Resident Engineering 2.3% M = 0.023 * (I+J+K)													2,923,000	2,389,000
Contingency 32.5% N = 0.325 * (I+J+K+L+M)													42,227,000	34,513,000
Subtotal (O = J+K+L+M+N)													84,255,000	68,863,000
DIRECT SUBCONTRACT O&M COSTS (OPERATIONS)														
On-post Rotary Kiln Incineration	A	4	7	144.36	/CY	72,777	CY	1.000	1.000	1.000			11,989,000	9,640,000
Subtotal (I')													11,989,000	9,640,000
INDIRECT SUBCONTR. O&M COSTS (OPERATIONS) — COST CODE: D														
Mob/Demob 0.0% J' = 0.000 * (I')													0	0
Contractor Markup 10.0% K' = 0.100 * (I'+J')													1,199,000	964,000
Engineering Design 0.0% L' = 0.000 * (I'+J'+K')													0	0
Resident Engineering 2.0% M' = 0.020 * (I'+J'+K')													264,000	212,000
Contingency 40.0% N' = 0.400 * (I'+J'+K'+L'+M')													5,381,000	4,327,000
Subtotal (O' = J'+K'+L'+M'+N')													6,843,000	5,503,000
DIRECT O&M REVENUES (OPERATIONS)													0	0
Subtotal (V)													0	0
TOTAL O&M COSTS (OPERATIONS) (P = I+I'+O+O'+V)													193,912,000	158,237,000

Table C-25 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 15: Dismantling, On-Post Rotary Kiln Incineration, On-Post Nonhazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Nonhazardous Waste Landfill Closure			A	7	30	0.13	/CY	72,777	CY	1.000	1.000	1.000		11,000	259,000	117,000
		Subtotal (Q)												11,000	259,000	117,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	R = 0.390 * (Q)												4,000	101,000	46,000
Contingency	30.0%	S = 0.300 * (Q+R)												5,000	108,000	49,000
		Subtotal (T)												9,000	209,000	94,000
TOTAL O&M COSTS (LONG-TERM ACTIVITIES) (U = Q+T)														20,000	468,000	211,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+P+U)															201,000,000	164,000,000

Table C-26 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 17: Dismantling, Hot Gas, On-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
Hot Gas for Agent Structures			LS	1	--	0.81	/SF	2,449,922	SF	1.000	1.000	1.000			2,265,000	2,265,000
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
On-post Hazardous Waste Landfill			LS	1	--	5.72	/CY	72,777	CY	1.000	1.000	1.000			475,000	475,000
On-post Hazardous Waste Landfill Closure			LS	2	--	3.80	/CY	72,777	CY	1.000	1.000	1.000			316,000	301,000
		Subtotal (A)													3,626,000	3,611,000
INDIRECT CAPITAL COSTS		COST CODE	LHSS													
Mob/Demob	4.5%	B = 0.045 * (A)													163,000	162,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													1,478,000	1,472,000
Engineering Design	6.5%	D = 0.065 * (A+B+C)													342,000	341,000
Resident Engineering	1.8%	E = 0.018 * (A+B+C)													92,000	92,000
Contingency	30.0%	F = 0.300 * (A+B+C+D+E)													1,710,000	1,703,000
		Subtotal (G =B+C+D+E+F)													3,786,000	3,770,000
TOTAL CAPITAL COSTS (H = A+G)															7,411,000	7,381,000

Table C-26 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 17: Dismantling, Hot Gas, On-Post Hazardous Waste Landfill

Cost Item	Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)														
Agent Monitoring	A	1	2	22.53	/CY	72,777	CY	1.000	1.000	1.000			1,871,000	1,827,000
Repair of Agent Structures	A	1	2	5.28	/CY	573,624	CY	1.000	1.000	1.000			3,456,000	3,374,000
Air Sampling	A	1	2	2,940,789.00	/YR	2	YR	1.000	1.000	1.000			6,712,000	6,552,000
Demolition of Agent Structures	A	1	2	23.31	/CY	573,624	CY	1.000	1.000	1.000			15,259,000	14,895,000
Loading Hazardous Debris	A	1	2	1.55	/CY	72,777	CY	1.600	1.000	1.000	Expansion		206,000	201,000
Agent Monitoring	A	1	2	22.53	/CY	72,777	CY	1.600	1.000	1.000	Expansion		2,994,000	2,923,000
Hot Gas for Agent Structures	A	1	2	15.96	/SF	2,449,922	SF	1.600	1.000	1.000	Expansion		71,393,000	69,693,000
Agent Monitoring	A	1	2	22.53	/CY	72,777	CY	1.600	1.000	1.000	Expansion		2,994,000	2,923,000
Debris Sampling, Process/Agent, Haz Disposal	A	1	2	213.05	/CY	72,777	CY	1.600	1.000	1.000	Expansion		28,310,000	27,636,000
Transportation of Hazardous Waste On-post	A	1	2	1.07	/CY	72,777	CY	1.600	4.000	1.000	Expansion, Miles		569,000	555,000
On-post Hazardous Waste Landfill	A	1	2	4.07	/CY	72,777	CY	1.000	1.000	1.000			338,000	330,000
Backfill of Structure Excavation	A	1	2	8.05	/CY	18,978	CY	1.000	1.000	1.000			174,000	170,000
Restoration of Structure Excavation	A	1	2	0.08	/SF	18,978	CY	1.000	1.000	1.000			2,000	2,000
Subtotal (I)													134,277,000	131,080,000
INDIRECT O&M COSTS (OPERATIONS) — COST CODE HMLSST														
Mob/Demob 2.0% J = 0.020 * (I)													2,686,000	2,622,000
Indirects, Overhead & Profit 39.0% K = 0.390 * (I+J)													53,416,000	52,144,000
Engineering Design 0.0% L = 0.000 * (I+J+K)													0	0
Resident Engineering 2.0% M = 0.020 * (I+J+K)													3,808,000	3,717,000
Contingency 31.3% N = 0.313 * (I+J+K+L+M)													60,683,000	59,238,000
Subtotal (O = J+K+L+M+N)													120,592,000	117,721,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)														
On-post Hazardous Waste Landfill Closure	A	2	30	0.13	/CY	72,777	CY	1.000	1.000	1.000		11,000	313,000	163,000
Subtotal (P)												11,000	313,000	163,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES) — COST CODE LLSL														
Indirects, Overhead & Profit 39.0% Q = 0.390 * (P)												4,000	122,000	64,000
Contingency 30.0% R = 0.300 * (P+Q)												5,000	131,000	68,000
Subtotal (S)												9,000	253,000	132,000
TOTAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]												20,000	255,435,000	249,096,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)													263,000,000	256,000,000

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Table C-27 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 18: Dismantling, Peroxide/Hypochlorite, On-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS																
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
Peroxide/Hypochlorite			LS	1	--	175.22	/CY	3,372	CY	1.000	1.000	1.000			674,000	674,000
Agent Monitoring			LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
On-post Hazardous Waste Landfill			LS	1	--	5.72	/CY	72,777	CY	1.000	1.000	1.000			475,000	475,000
On-post Hazardous Waste Landfill Closure			LS	2	--	3.80	/CY	72,777	CY	1.000	1.000	1.000			316,000	301,000
		Subtotal (A)													2,036,000	2,020,000
INDIRECT CAPITAL COSTS		COST CODE	LMSS													
Mob/Demob	3.9%	B = 0.039 * (A)													79,000	78,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)													825,000	819,000
Engineering Design	4.5%	D = 0.045 * (A+B+C)													132,000	131,000
Resident Engineering	1.5%	E = 0.015 * (A+B+C)													44,000	44,000
Contingency	27.5%	F = 0.275 * (A+B+C+D+E)													857,000	850,000
		Subtotal (G =B+C+D+E+F)													1,937,000	1,922,000
TOTAL CAPITAL COSTS (H = A+G)															3,972,000	3,943,000

Table C-27 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 18: Dismantling, Peroxide/Hypochlorite, On-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Agent Monitoring			A	1	2	22.53	/CY	72,777	CY	1.000	1.000	1.000			1,871,000	1,827,000
Repair of Agent Structures			A	1	2	5.28	/CY	573,624	CY	1.000	1.000	1.000			3,456,000	3,374,000
Air Sampling			A	1	2	2,940,789.00	/YR	2	YR	1.000	1.000	1.000			6,712,000	6,552,000
Demolition of Agent Structures			A	1	2	23.31	/CY	573,624	CY	1.000	1.000	1.000			15,259,000	14,895,000
Loading Hazardous Debris			A	1	2	1.55	/CY	72,777	CY	1.600	1.000	1.000	Expansion		206,000	201,000
Agent Monitoring			A	1	2	22.53	/CY	72,777	CY	1.600	1.000	1.000	Expansion		2,994,000	2,923,000
Peroxide/Hypochlorite			A	1	2	109.40	/CY	3,372	CY	1.600	1.000	1.000	Expansion		674,000	658,000
Agent Monitoring			A	1	2	22.53	/CY	72,777	CY	1.600	1.000	1.000	Expansion		2,994,000	2,923,000
Debris Sampling, Process/Agent, Haz Disposal			A	1	2	213.05	/CY	72,777	CY	1.600	1.000	1.000	Expansion		28,310,000	27,636,000
Transportation of Hazardous Waste On-post			A	1	2	1.07	/CY	72,777	CY	1.600	4.000	1.000	Expansion, Miles		569,000	555,000
On-post Hazardous Waste Landfill			A	1	2	4.07	/CY	72,777	CY	1.000	1.000	1.000			338,000	330,000
Backfill of Structure Excavation			A	1	2	8.05	/CY	18,978	CY	1.000	1.000	1.000			174,000	170,000
Restoration of Structure Excavation			A	1	2	0.08	/SF	18,978	CY	1.000	1.000	1.000			2,000	2,000
		Subtotal (I)													63,558,000	62,045,000
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	HMLSST													
Mob/Demob	2.0%	J = 0.020 * (I)													1,271,000	1,241,000
Indirects, Overhead & Profit	39.0%	K = 0.390 * (I+J)													25,284,000	24,682,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	2.0%	M = 0.020 * (I+J+K)													1,802,000	1,759,000
Contingency	31.3%	N = 0.313 * (I+J+K+L+M)													28,724,000	28,040,000
		Subtotal (O = J+K+L+M+N)													57,080,000	55,721,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Hazardous Waste Landfill Closure			A	2	30	0.13	/CY	72,777	CY	1.000	1.000	1.000		11,000	313,000	163,000
		Subtotal (P)												11,000	313,000	163,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												4,000	122,000	64,000
Contingency	30.0%	R = 0.300 * (P+Q)												5,000	131,000	68,000
		Subtotal (S)												9,000	253,000	132,000
TOTAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														20,000	121,205,000	118,062,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = H+T)															125,000,000	122,000,000

Table C-28 Cost Estimate - No Future Use, Agent History Medium Group
Alternative No. 18A: Sand Blasting, Dismantling, Peroxide/Hypochlorite, On-Post Hazardous Waste Landfill

Cost Item	Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Volume Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT CAPITAL COSTS														
Agent Monitoring	LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
Sand Blasting	LS	1	--	0.38	/SF	358,159	SF	1.000	1.000	1.000			155,000	155,000
Agent Monitoring	LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
Peroxide/Hypochlorite	LS	1	--	175.22	/CY	3,372	CY	1.000	1.000	1.000			674,000	674,000
Agent Monitoring	LS	1	--	2.29	/CY	72,777	CY	1.000	1.000	1.000			190,000	190,000
On-post Hazardous Waste Landfill	LS	1	--	5.72	/CY	72,777	CY	1.000	1.000	1.000			475,000	475,000
On-post Hazardous Waste Landfill Closure	LS	2	--	3.80	/CY	72,777	CY	1.000	1.000	1.000			316,000	301,000
Subtotal (A)													2,191,000	2,176,000

Cost Item	%	COST CODE	LMSS	1995 ($) Total Cost	1995 ($) PW Cost
INDIRECT CAPITAL COSTS					
Mob/Demob	3.9%	B = 0.039 * (A)		85,000	84,000
Indirects, Overhead & Profit	39.0%	C = 0.390 * (A+B)		888,000	881,000
Engineering Design	4.5%	D = 0.045 * (A+B+C)		142,000	141,000
Resident Engineering	1.5%	E = 0.015 * (A+B+C)		47,000	47,000
Contingency	27.5%	F = 0.275 * (A+B+C+D+E)		922,000	916,000
		Subtotal (G =B+C+D+E+F)		2,084,000	2,070,000
TOTAL CAPITAL COSTS (H = A+G)				4,275,000	4,246,000

Table C-28 Cost Estimate - No Future Use, Agent History Medium Group

Alternative No. 18A: Sand Blasting, Dismantling, Peroxide/Hypochlorite, On-Post Hazardous Waste Landfill

Cost Item			Cost Type	Start Year	End Year	1992 ($) Unit Cost	Units	Quantity	Units	Exp/Red Factor	Mileage Factor	Other Factor	Description	1995 ($) Annual Cost	1995 ($) Total Cost	1995 ($) PW Cost
DIRECT O&M COSTS (OPERATIONS)																
Agent Monitoring			A	1	2	22.53	/CY	72,777	CY	1.000	1.000	1.000			1,871,000	1,827,000
Repair of Agent Structures			A	1	2	5.28	/CY	573,624	CY	1.000	1.000	1.000			3,456,000	3,374,000
Air Sampling			A	1	2	2,940,789.00	/YR	2	YR	1.000	1.000	1.000			6,712,000	6,552,000
Sand Blasting			A	1	2	2.75	/SF	358,159	SF	1.000	1.000	1.000			1,124,000	1,097,000
Agent Monitoring			A	1	2	22.53	/CY	72,777	CY	1.000	1.000	1.000			1,871,000	1,827,000
Demolition of Agent Structures			A	1	2	23.31	/CY	573,624	CY	1.000	1.000	1.000			15,259,000	14,895,000
Loading Hazardous Debris			A	1	2	1.55	/CY	72,777	CY	1.600	1.000	1.000	Expansion		206,000	201,000
Peroxide/Hypochlorite			A	1	2	109.40	/CY	3,372	CY	1.600	1.000	1.000	Expansion		674,000	658,000
Agent Monitoring			A	1	2	22.53	/CY	72,777	CY	1.600	1.000	1.000	Expansion		2,994,000	2,923,000
Debris Sampling, Process/Agent, Haz Disposal			A	1	2	213.05	/CY	72,777	CY	1.600	1.000	1.000	Expansion		28,310,000	27,636,000
Transportation of Hazardous Waste On-post			A	1	2	1.07	/CY	72,777	CY	1.600	4.000	1.000	Expansion, Miles		569,000	555,000
On-post Hazardous Waste Landfill			A	1	2	4.07	/CY	72,777	CY	1.000	1.000	1.000			338,000	330,000
Backfill of Structure Excavation			A	1	2	8.05	/CY	18,978	CY	1.000	1.000	1.000			174,000	170,000
Restoration of Structure Excavation			A	1	2	0.08	/SF	18,978	CY	1.000	1.000	1.000			2,000	2,000
		Subtotal (I)													63,560,000	62,046,000
INDIRECT O&M COSTS (OPERATIONS)		COST CODE	HMLSST													
Mob/Demob	2.0%	J = 0.020 * (I)													1,271,000	1,241,000
Indirects, Overhead & Profit	39.0%	K = 0.390 * (I+J)													25,284,000	24,682,000
Engineering Design	0.0%	L = 0.000 * (I+J+K)													0	0
Resident Engineering	2.0%	M = 0.020 * (I+J+K)													1,802,000	1,759,000
Contingency	31.3%	N = 0.313 * (I+J+K+L+M)													28,724,000	28,040,000
		Subtotal (O = J+K+L+M+N)													57,082,000	55,723,000
DIRECT O&M COSTS (LONG-TERM ACTIVITIES)																
On-post Hazardous Waste Landfill Closure			A	2	30	0.13	/CY	72,777	CY	1.000	1.000	1.000		11,000	313,000	163,000
		Subtotal (P)												11,000	313,000	163,000
INDIRECT O&M COSTS (LONG-TERM ACTIVITIES)		COST CODE	LLSL													
Indirects, Overhead & Profit	39.0%	Q = 0.390 * (P)												4,000	122,000	64,000
Contingency	30.0%	R = 0.300 * (P+Q)												5,000	131,000	68,000
		Subtotal (S)												9,000	253,000	132,000
TOTAL O&M COSTS (T = I+O+P+S) [Note: Total O&M Annual Cost Only Includes Long-Term Activities]														20,000	121,207,000	118,064,000
TOTAL CAPITAL COSTS AND TOTAL O&M COSTS (U = II+T)															125,000,000	122,000,000

TABLE C4.0-1
MARKUP MATRIX
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08-Jul-93

CAPITAL COST

CONSIDERATION FACTORS	LEVEL	EXAMPLES	MOB/ DEMOB	INDIRECTS O&P	DESIGN ENGR	RESIDENT ENGR	CNTGNCY
CONTAMINATION	Low	Level D or no protection Up to 10% Level C No Level A or B	2.00%	34.00%		1.00%	25.00%
	Medium	From 10% to 25% Level C No Level A or B	4.50%	39.00%		2.00%	30.00%
	High	26% or greater Level C Level A or B	7.00%	44.00%		3.00%	40.00%
TECHNOLOGY	Low	Excavation, backfill, transportation, normal civil/structural construction Vapor Extraction, Landfill	2.00%	39.00%	3.00%	1.00%	25.00%
	Medium	Demolition, Proven Decon Methods, Pump & & Treat Facilities, Mech & Elect Const, UXO D&D Solidification	4.50%	39.00%	4.50%	2.00%	30.00%
	High	Incineration, Thermal Desorption In-Situ Vitrification, Unproven Decon Methods	7.00%	39.00%	6.50%	3.00%	40.00%
JOB SIZE	Small	Less than 20 Craft personnel	4.50%	44.00%		2.00%	30.00%
	Medium	20 to 60 Craft personnel	4.50%	39.00%		2.00%	30.00%
	Large	More than 60 Craft personnel	4.50%	34.00%		2.00%	30.00%
DURATION	Short	< 3 Years	4.50%	39.00%		1.00%	25.00%
	Medium	3 to 7 Years	4.50%	39.00%		2.00%	30.00%
	Long	> 7 Years	4.50%	39.00%		3.00%	40.00%

TABLE C4.0-1
MARKUP MATRIX
C:\RMAFS\BACKUP\MAMUTRX.WQ1
08-Jul-93

O&M COST

CONSIDERATION FACTORS	LEVEL	EXAMPLES	MOB/ DEMOB	INDIRECTS O&P	DESIGN ENGR	RESIDENT ENGR	CNTGNCY
CONTAMINATION	Low	Level D or no protection Up to 10% Level C No Level A or B	2.00%	34.00%		1.00%	25.00%
	Medium	From 10% to 25% Level C No Level A or B	4.50%	39.00%		2.00%	30.00%
	High	26% or greater Level C Level A or B	7.00%	44.00%		3.00%	40.00%
TECHNOLOGY	Low	Excavation, backfill, transportation, normal civil/structural construction Vapor Extraction, Landfill	2.00%	39.00%	0.00%	1.00%	25.00%
	Medium	Demolition, Proven Decon Methods, Pump & & Treat Facilities, Mech & Elect Const, UXO D&D Solidification	4.50%	39.00%	1.00%	2.00%	30.00%
	High	Incineration, Thermal Desorption In-Situ Vitrification, Unproven Decon Methods	7.00%	39.00%	2.00%	3.00%	40.00%
JOB SIZE	Small	Less than 20 Craft personnel	4.50%	44.00%		2.00%	30.00%
	Medium	20 to 60 Craft personnel	4.50%	39.00%		2.00%	30.00%
	Large	More than 60 Craft personnel	4.50%	34.00%		2.00%	30.00%
DURATION	Short	< 3 Years	4.50%	39.00%		1.00%	25.00%
	Medium	3 to 7 Years	4.50%	39.00%		2.00%	30.00%
	Long	> 7 Years	4.50%	39.00%		3.00%	40.00%

TABLE C4.0-1
MARKUP MATRIX
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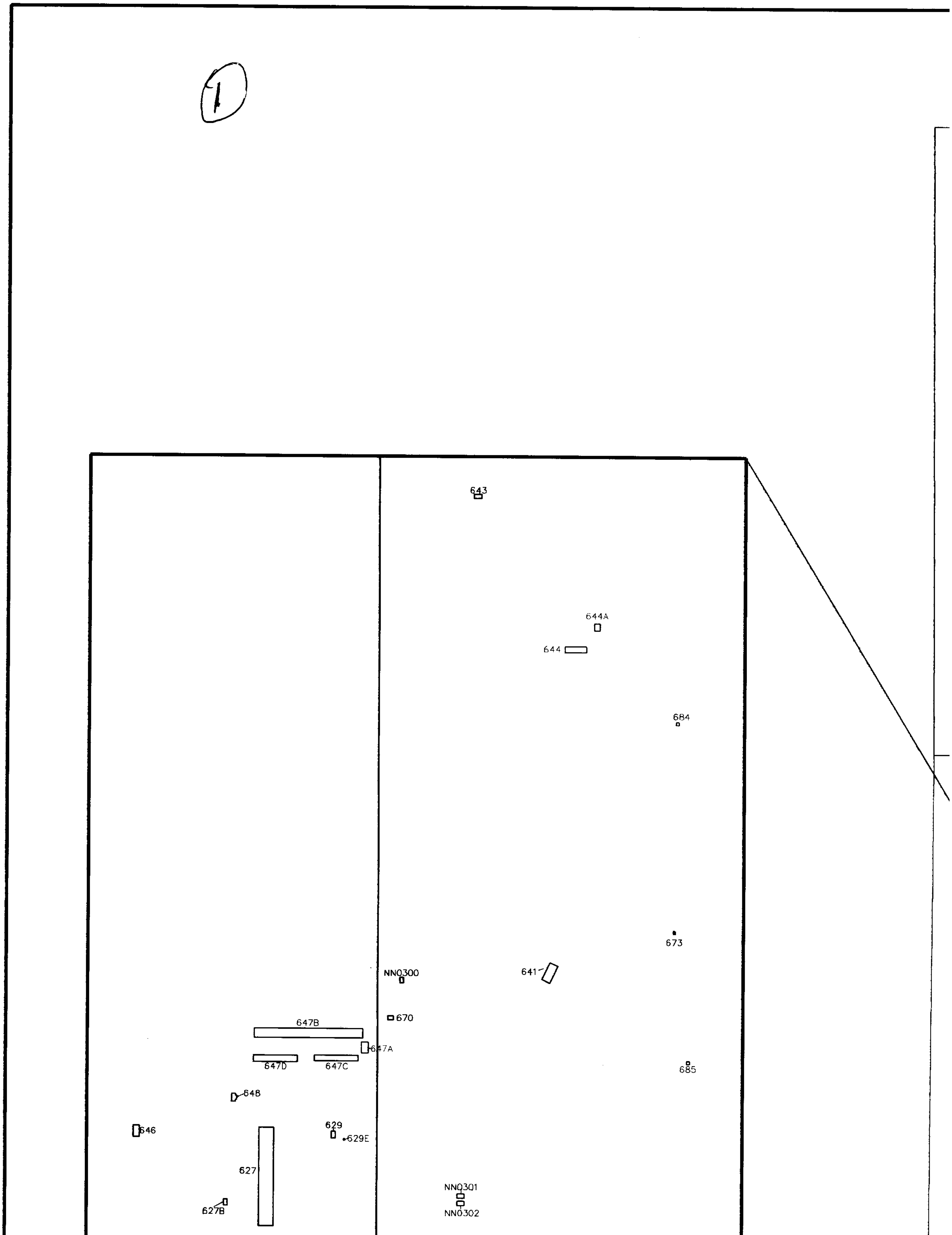
08-Jul-93

LONG TERM COST

CONSIDERATION FACTORS	LEVEL	EXAMPLES	INDIRECTS O&P	CNTGNCY
CONTAMINATION	Low	Level D or no protection Up to 10% Level C No Level A or B	34.00%	25.00%
	Medium	From 10% to 25% Level C No Level A or B	39.00%	30.00%
	High	26% or greater Level C Level A or B	44.00%	40.00%
TECHNOLOGY	Low	Fencing, Cap Repair, Erosion Control Soil Monitoring, Leachate Collection	39.00%	25.00%
	Medium	None	39.00%	30.00%
	High	None	39.00%	40.00%
JOB SIZE	Small	Less than 20 Craft personnel	44.00%	30.00%
	Medium	20 to 60 Craft personnel	39.00%	30.00%
	Large	More than 60 Craft personnel	34.00%	30.00%
DURATION	Short	< 3 Years	39.00%	25.00%
	Medium	3 to 7 Years	39.00%	30.00%
	Long	> 7 Years	39.00%	40.00%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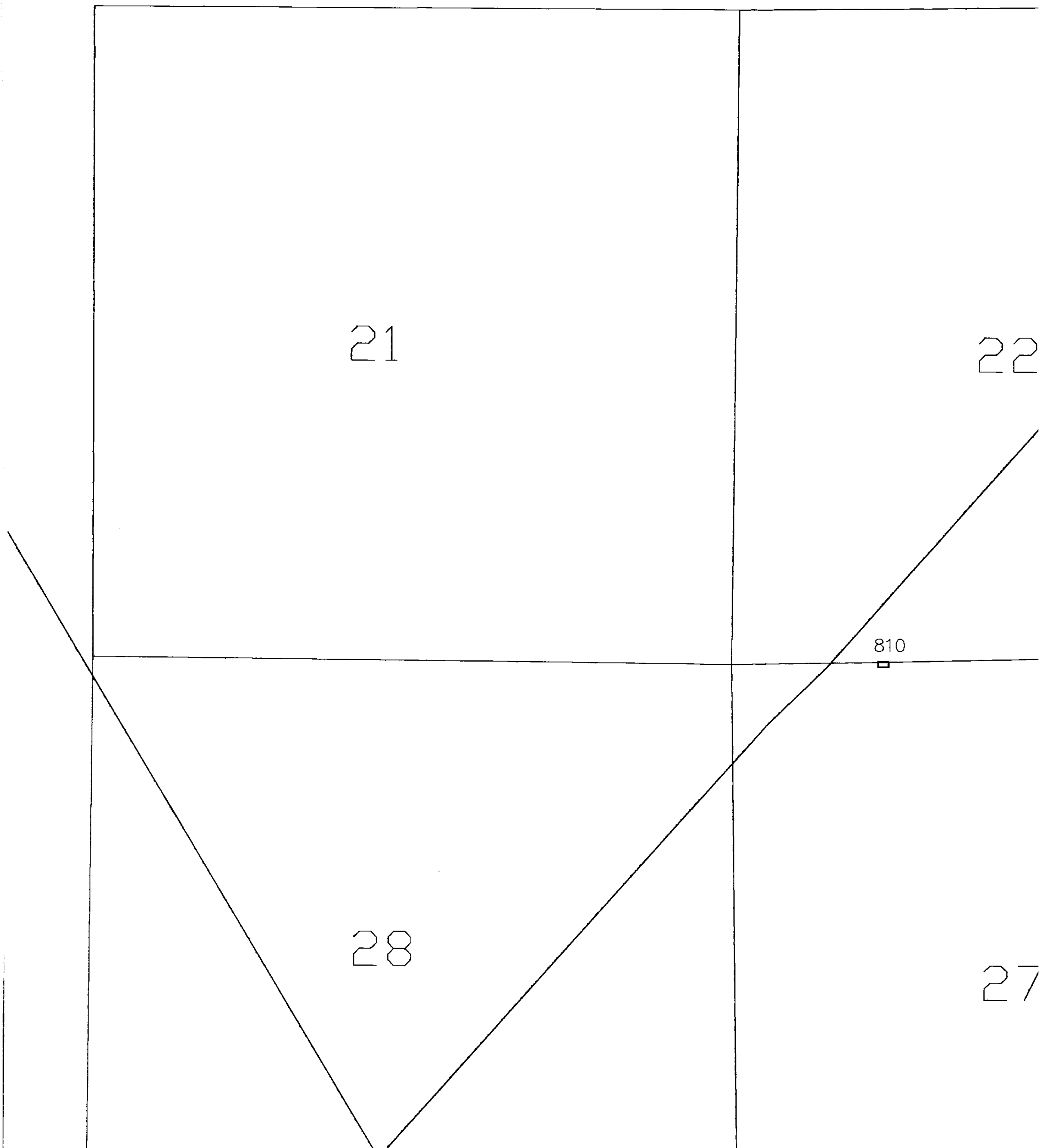

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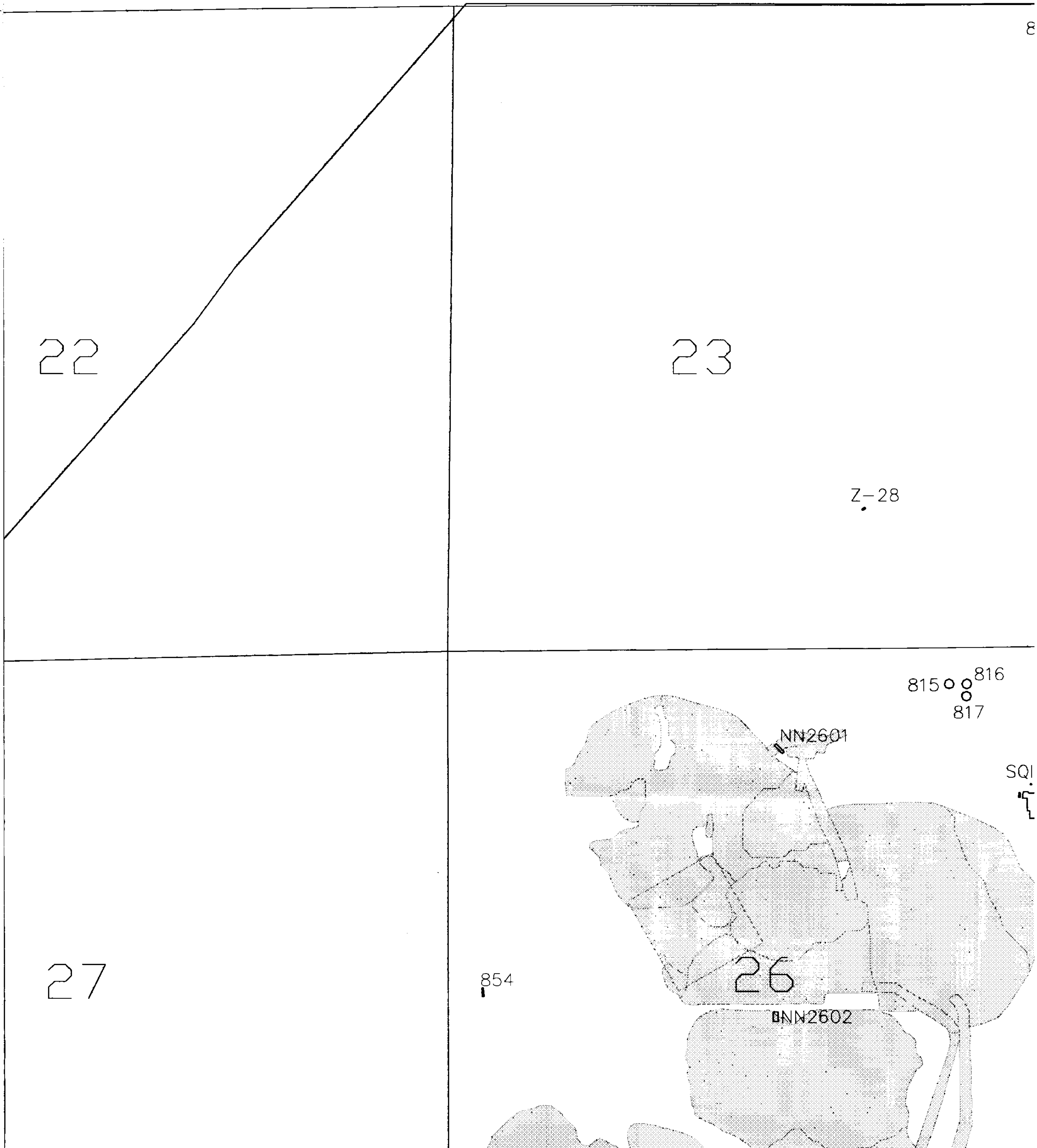

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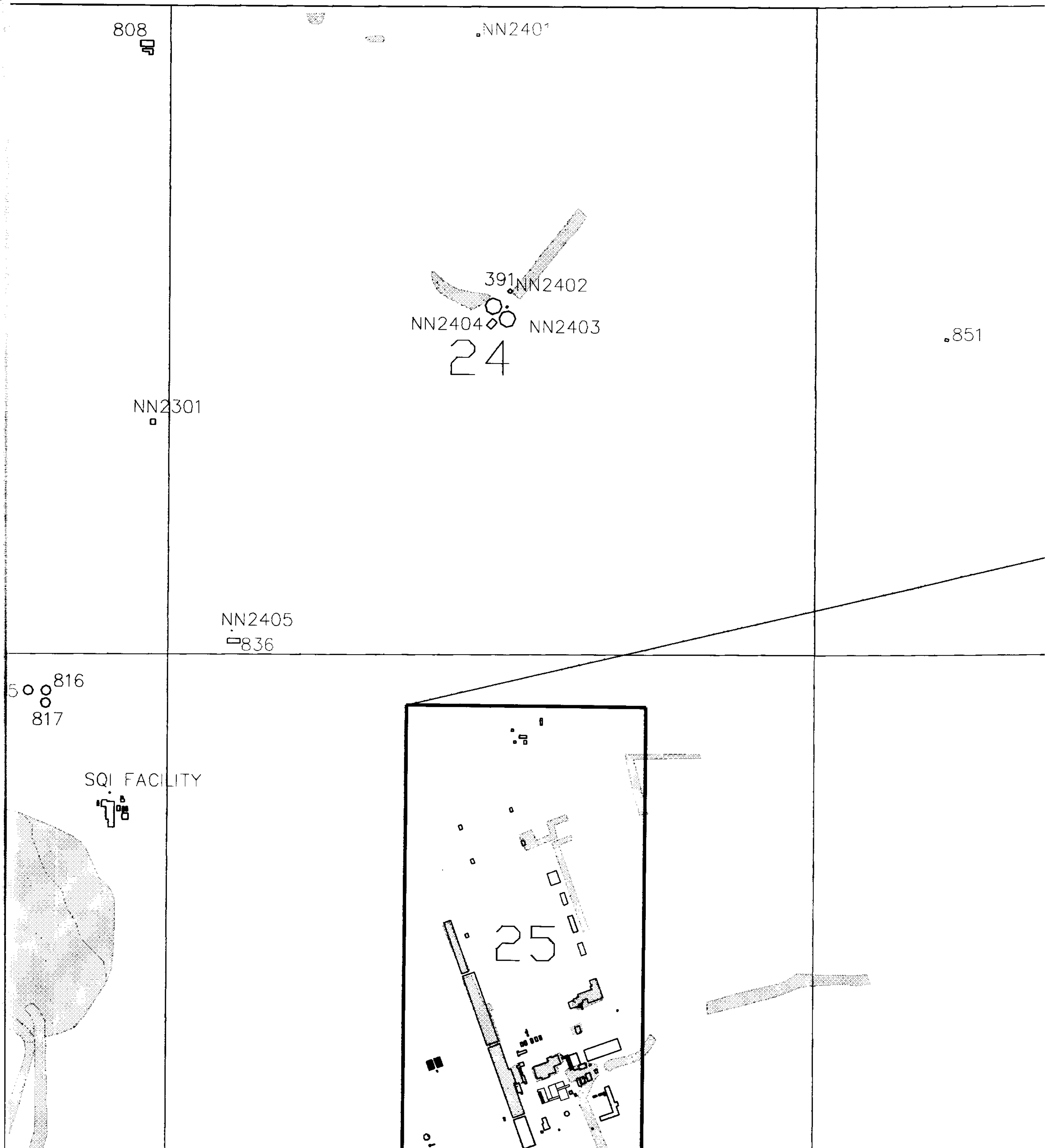

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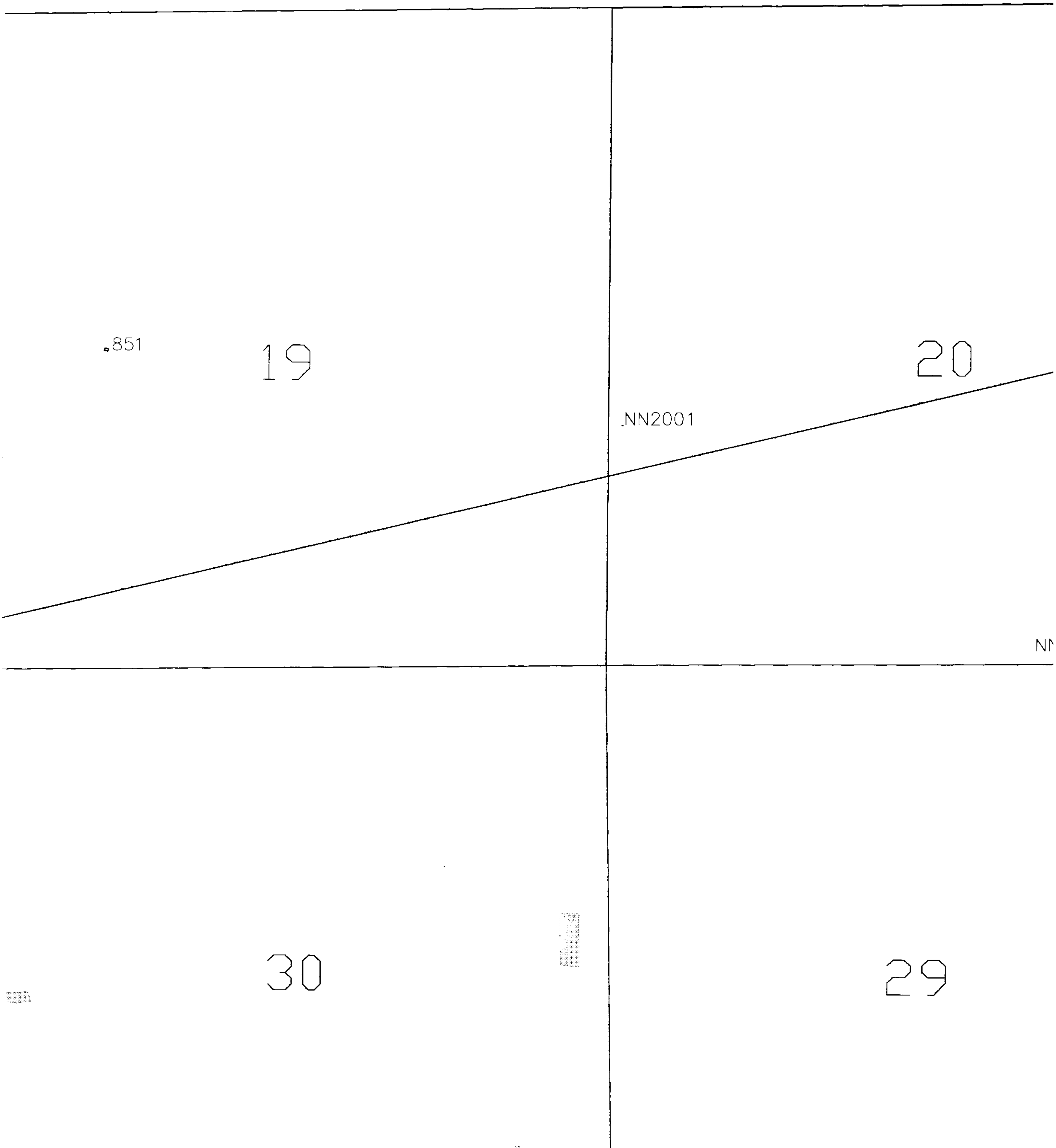

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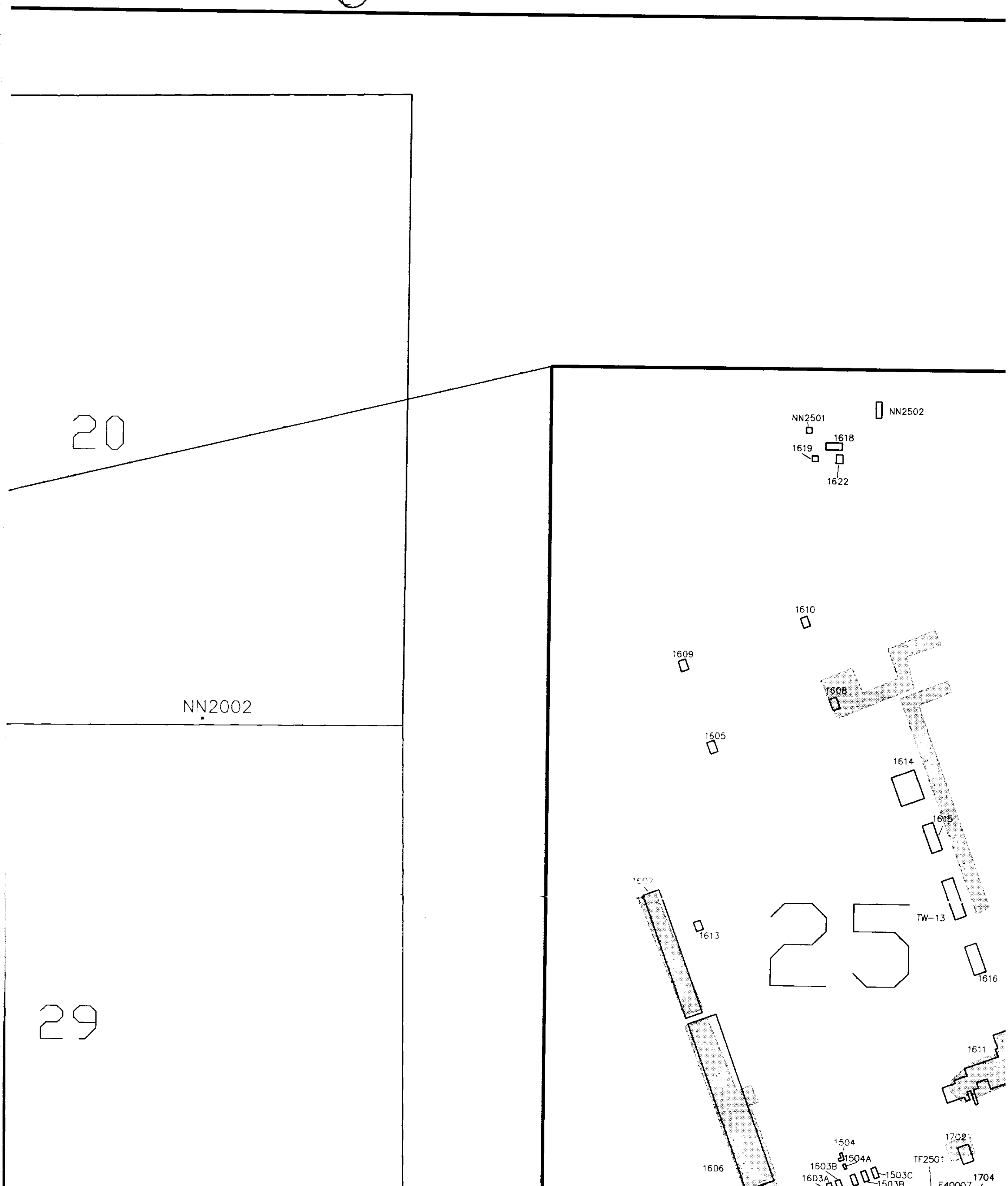
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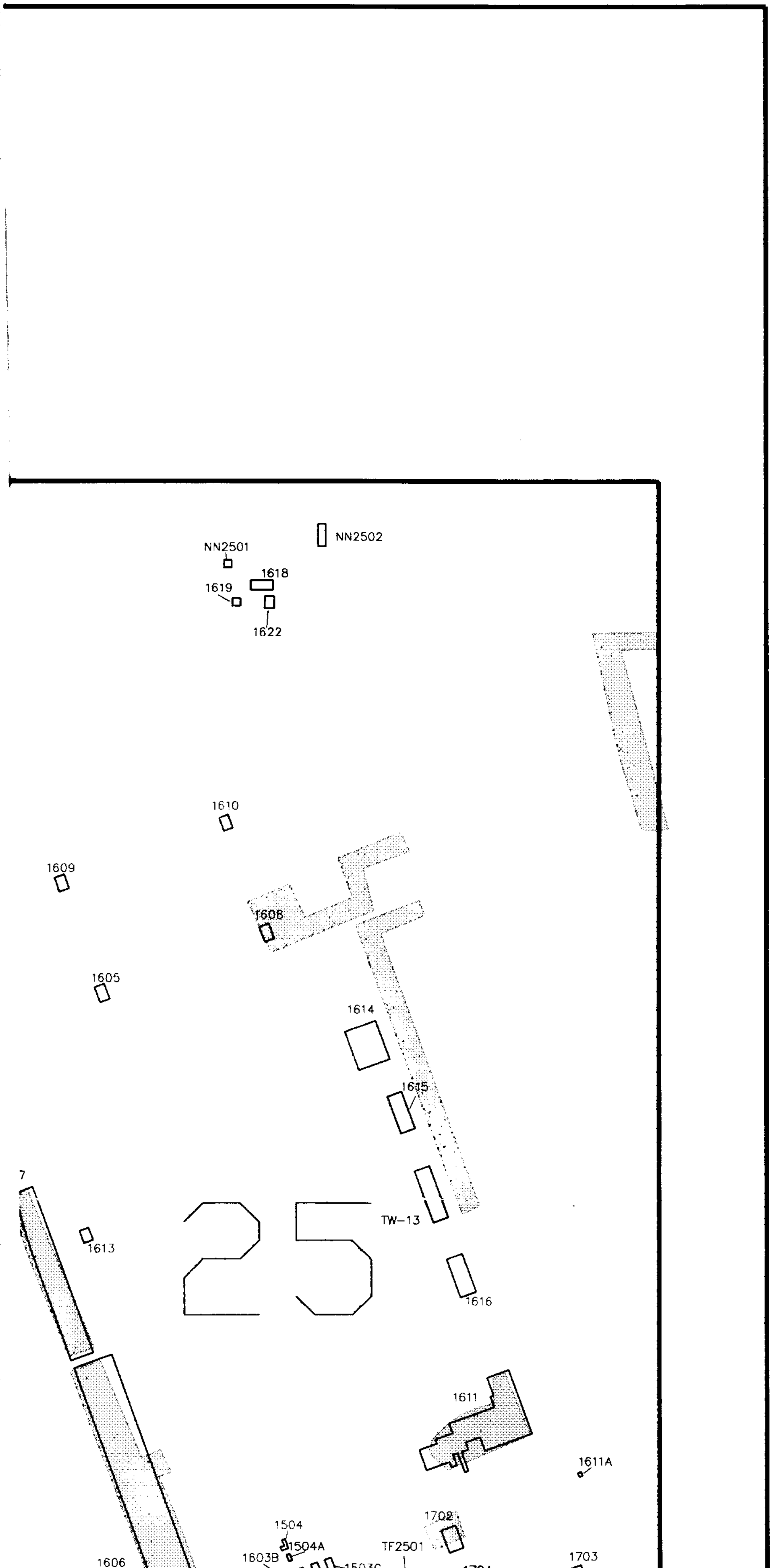

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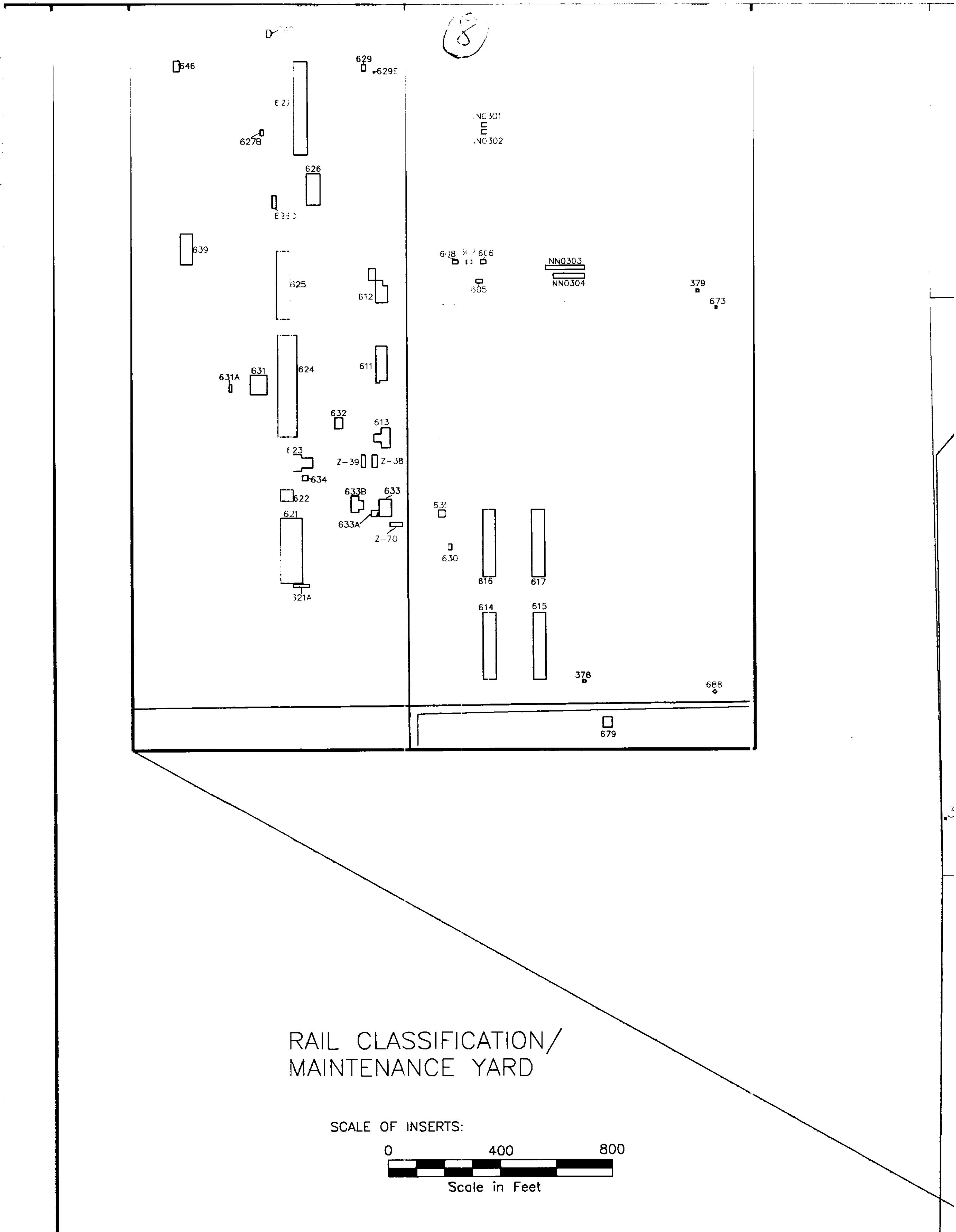
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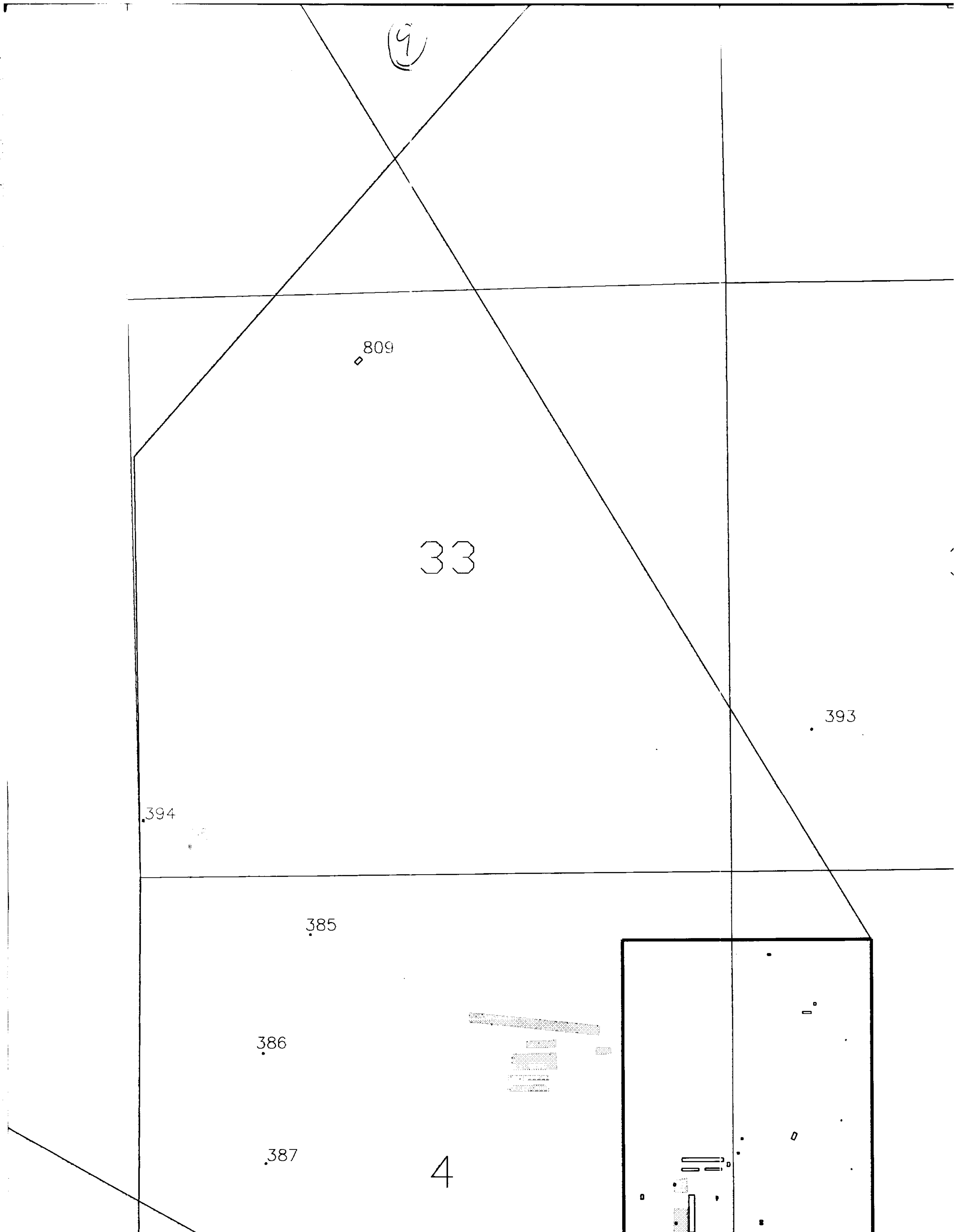
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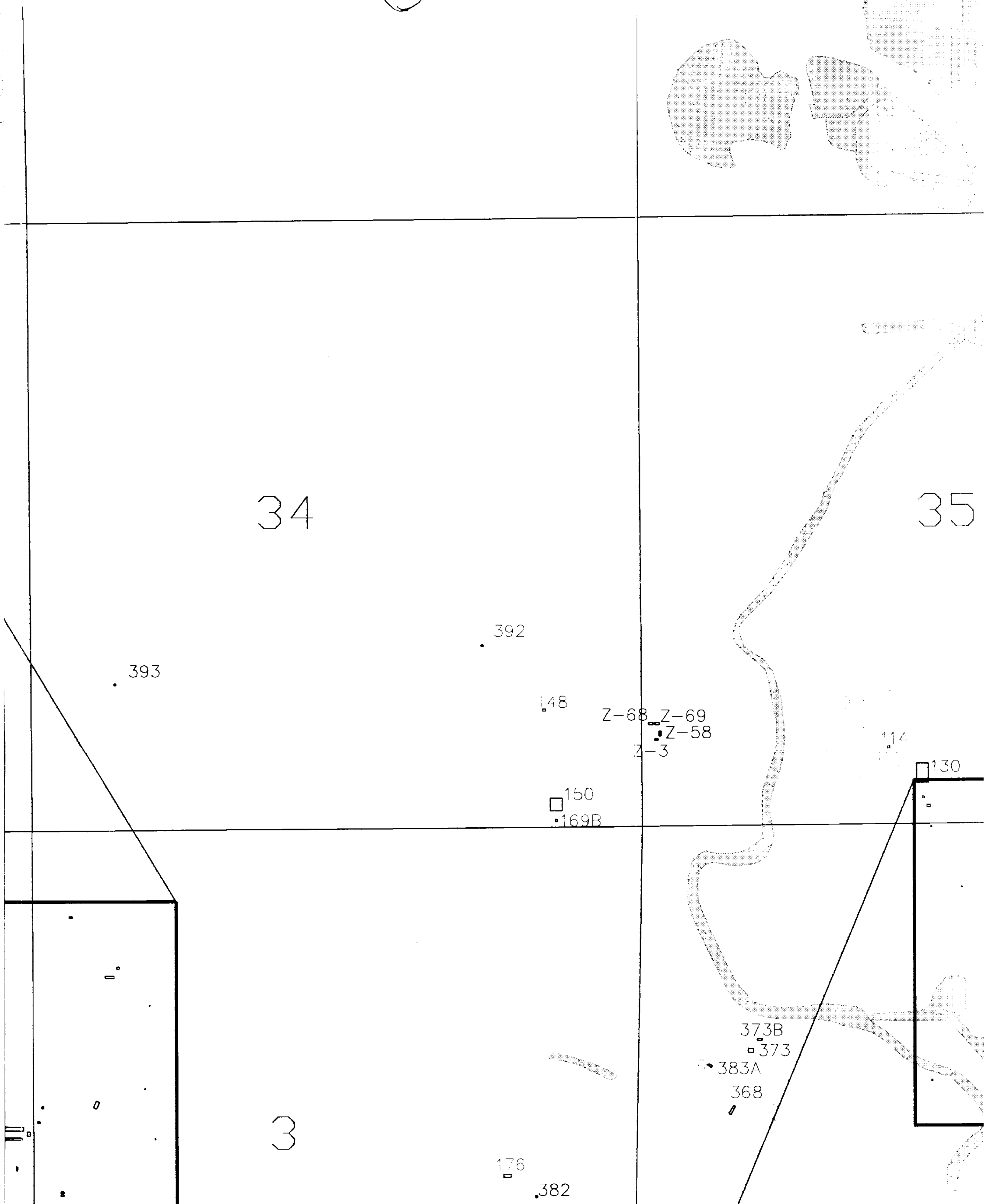

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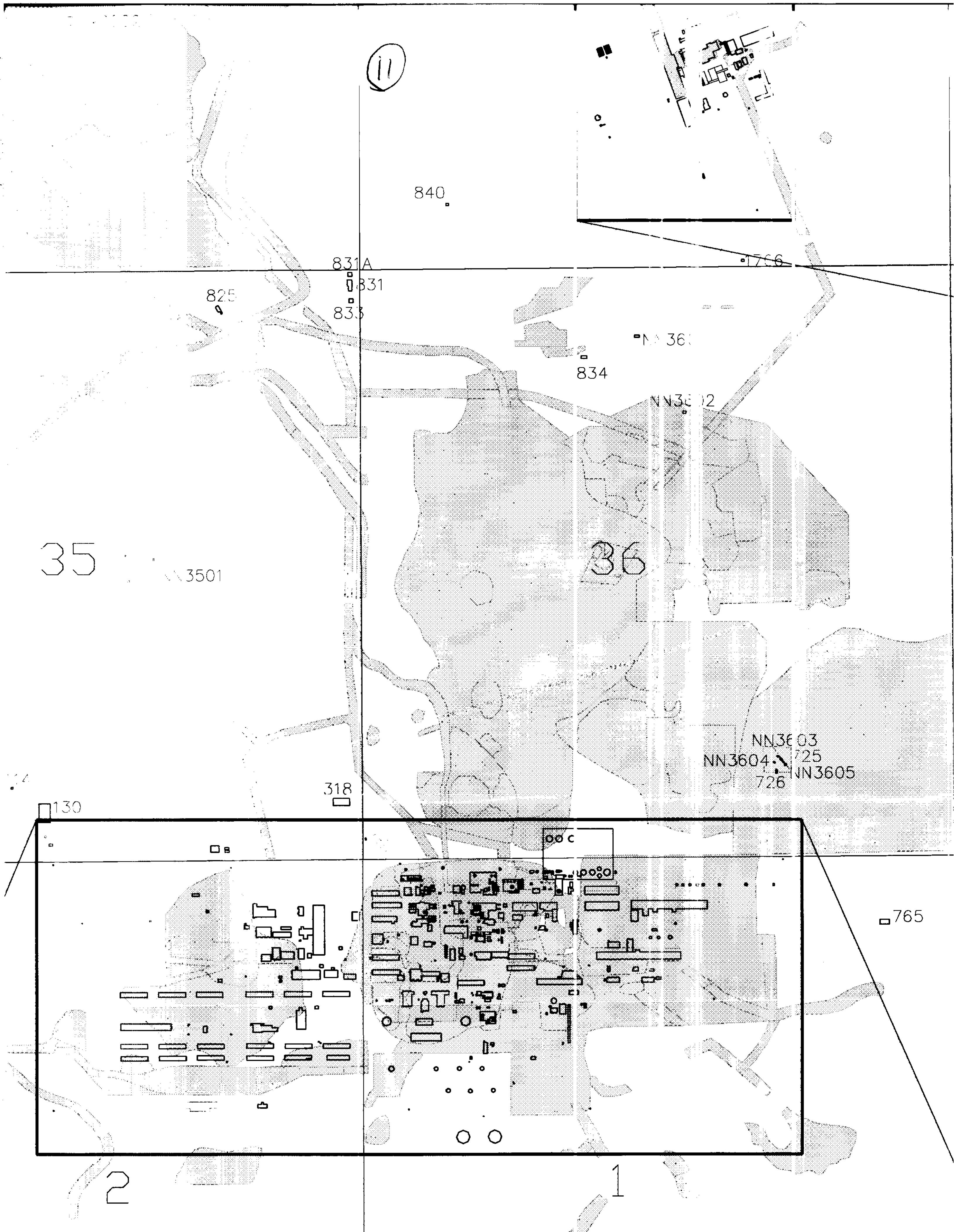

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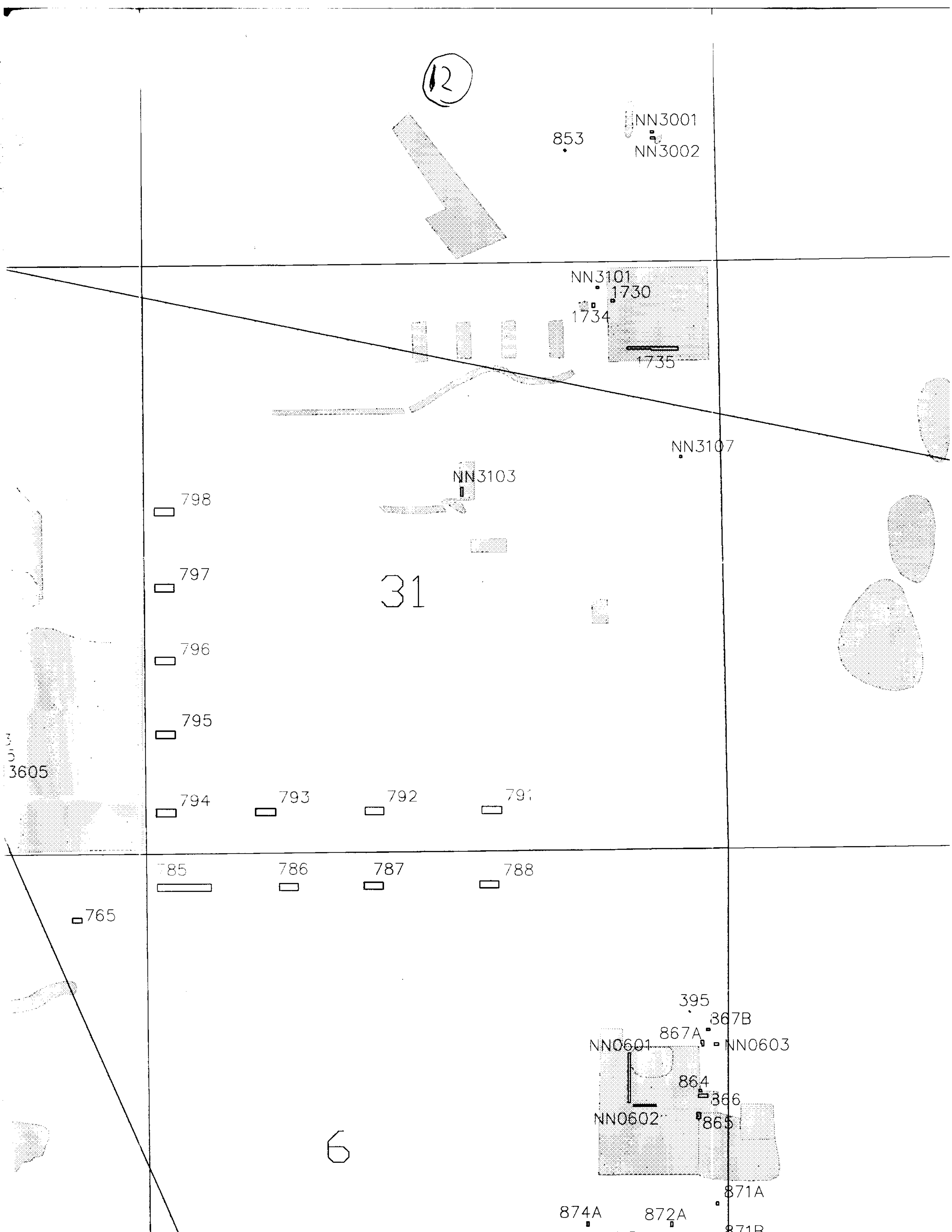
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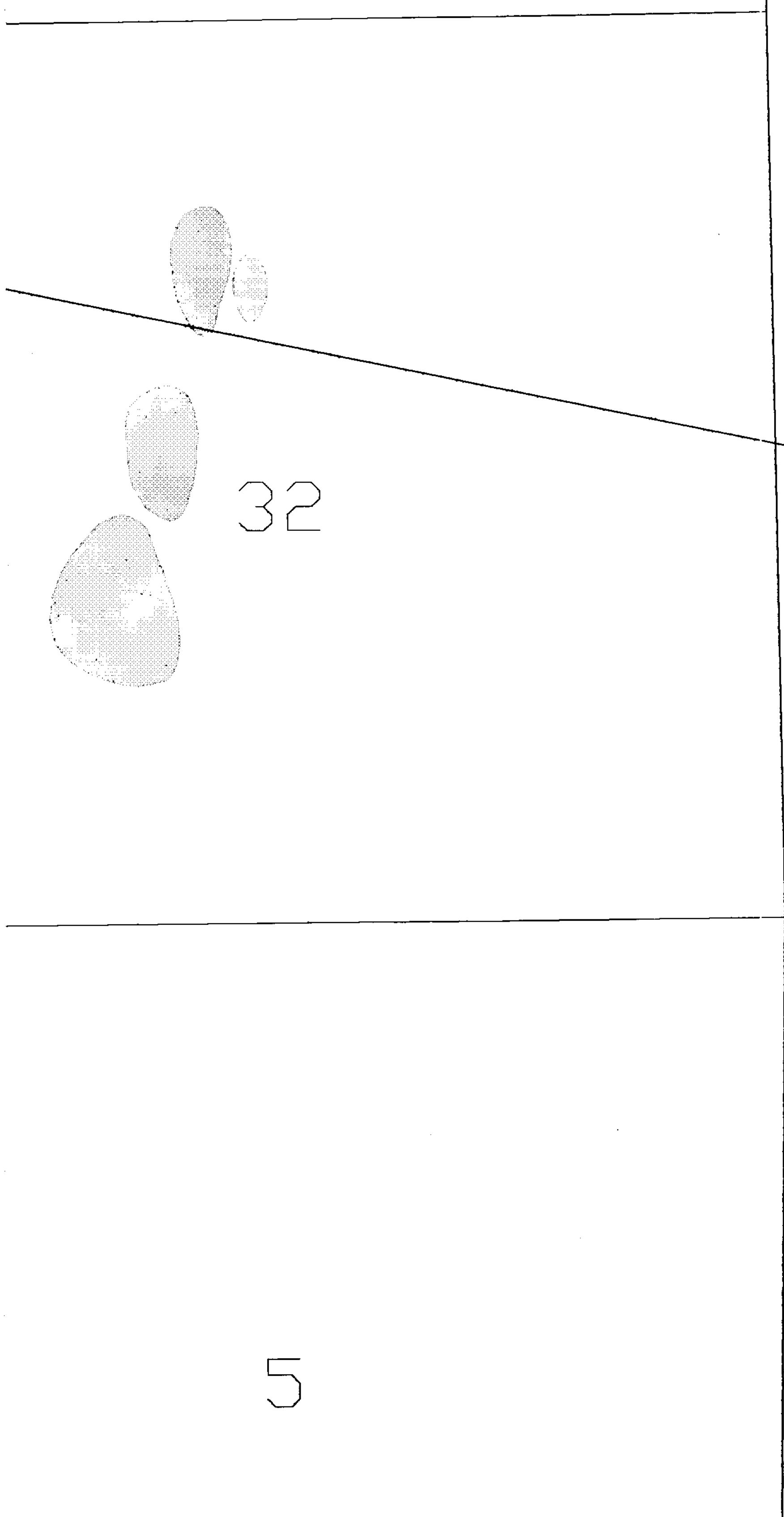

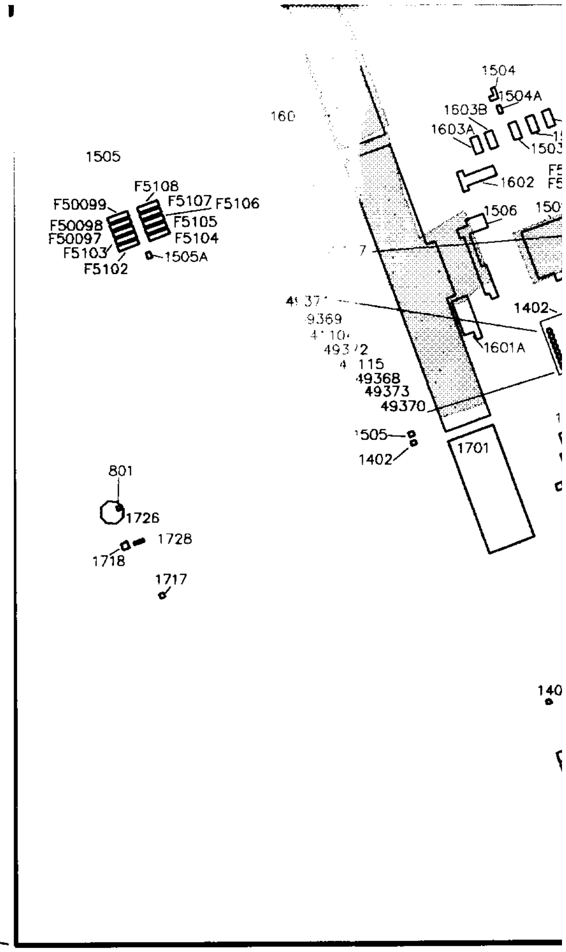

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EXPLANATION

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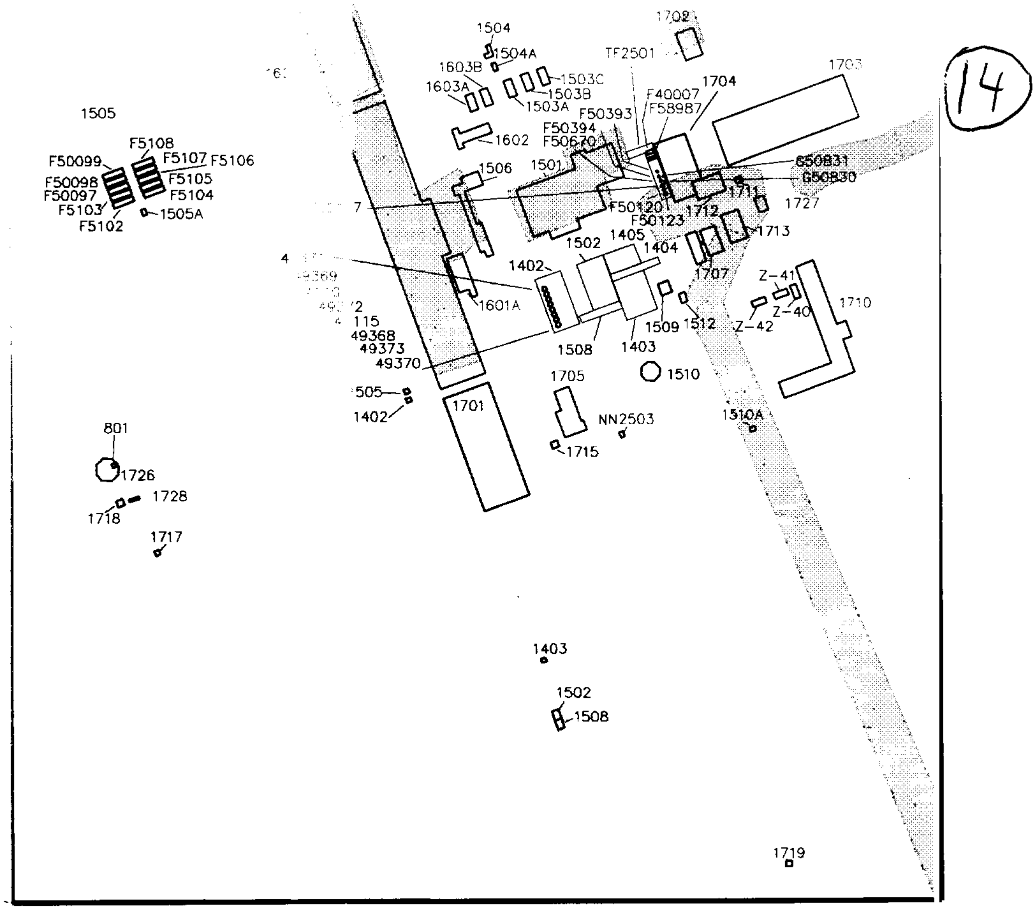

NORTH PLANTS

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ANATION

Buildings with Future Use
No Potential Exposure Problems

Buildings with No Future Use,
Nonmanufacturing History

Buildings with No Future Use,
Manufacturing History

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RAIL CLASSIFICATION/ MAINTENANCE YARD

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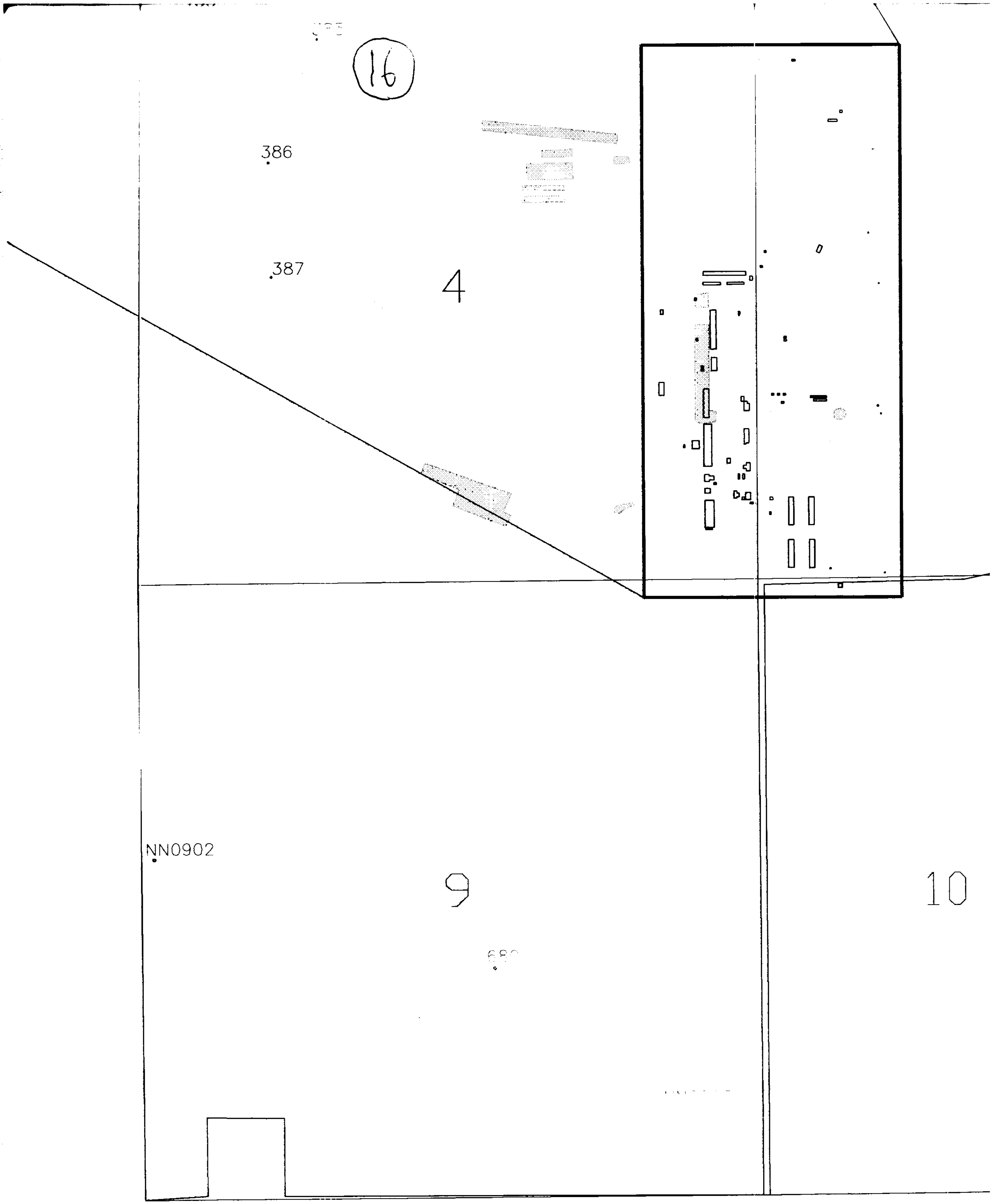

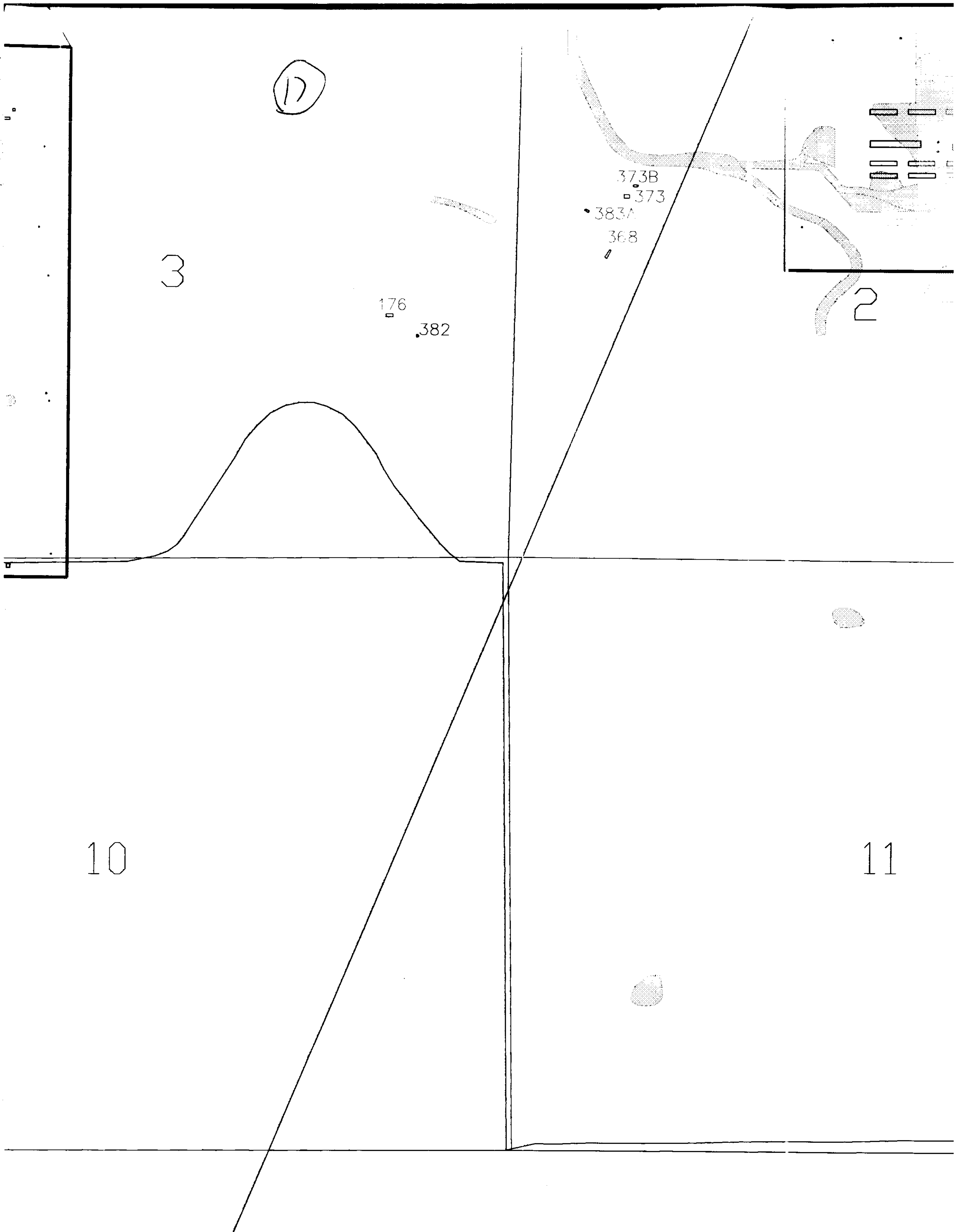

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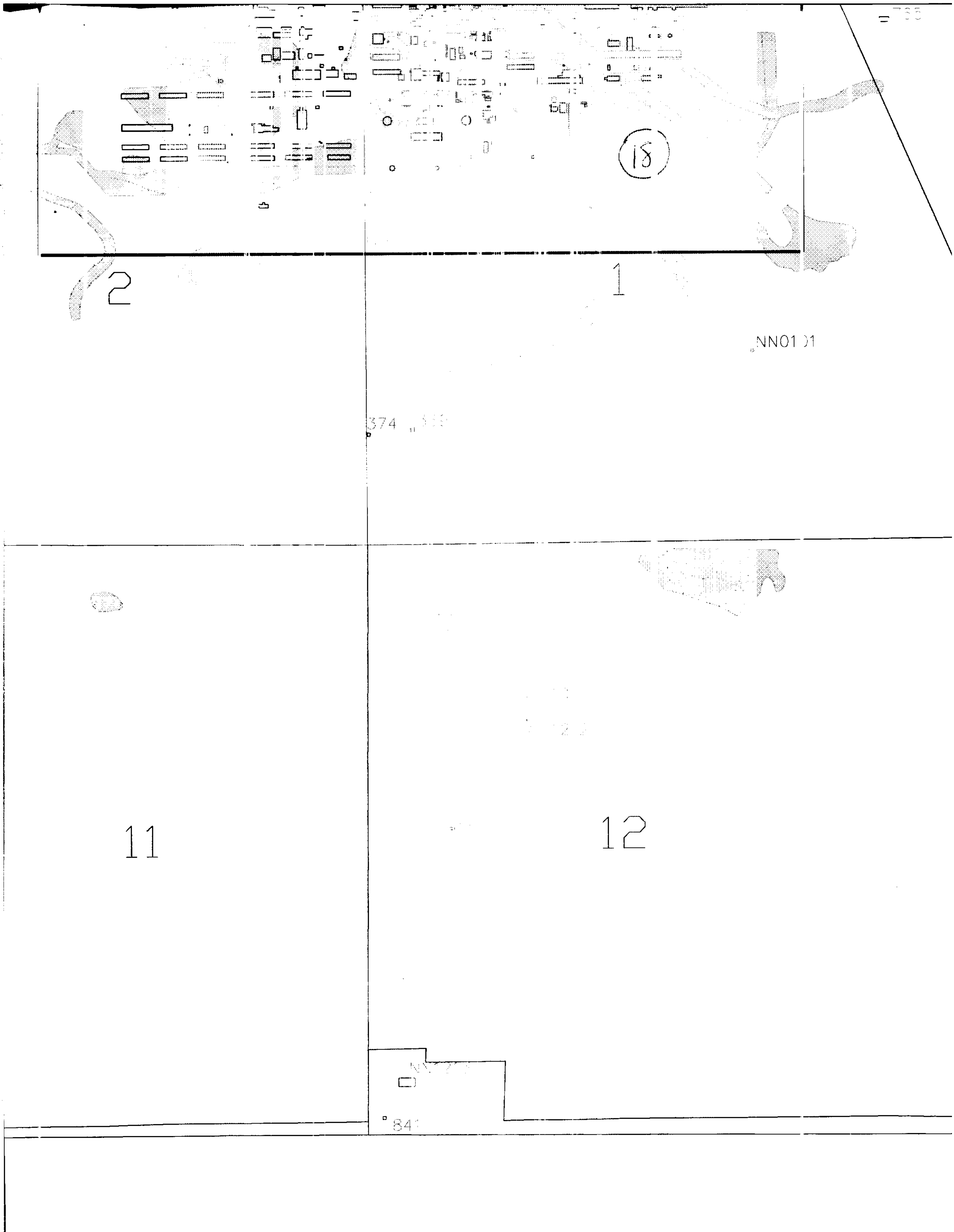
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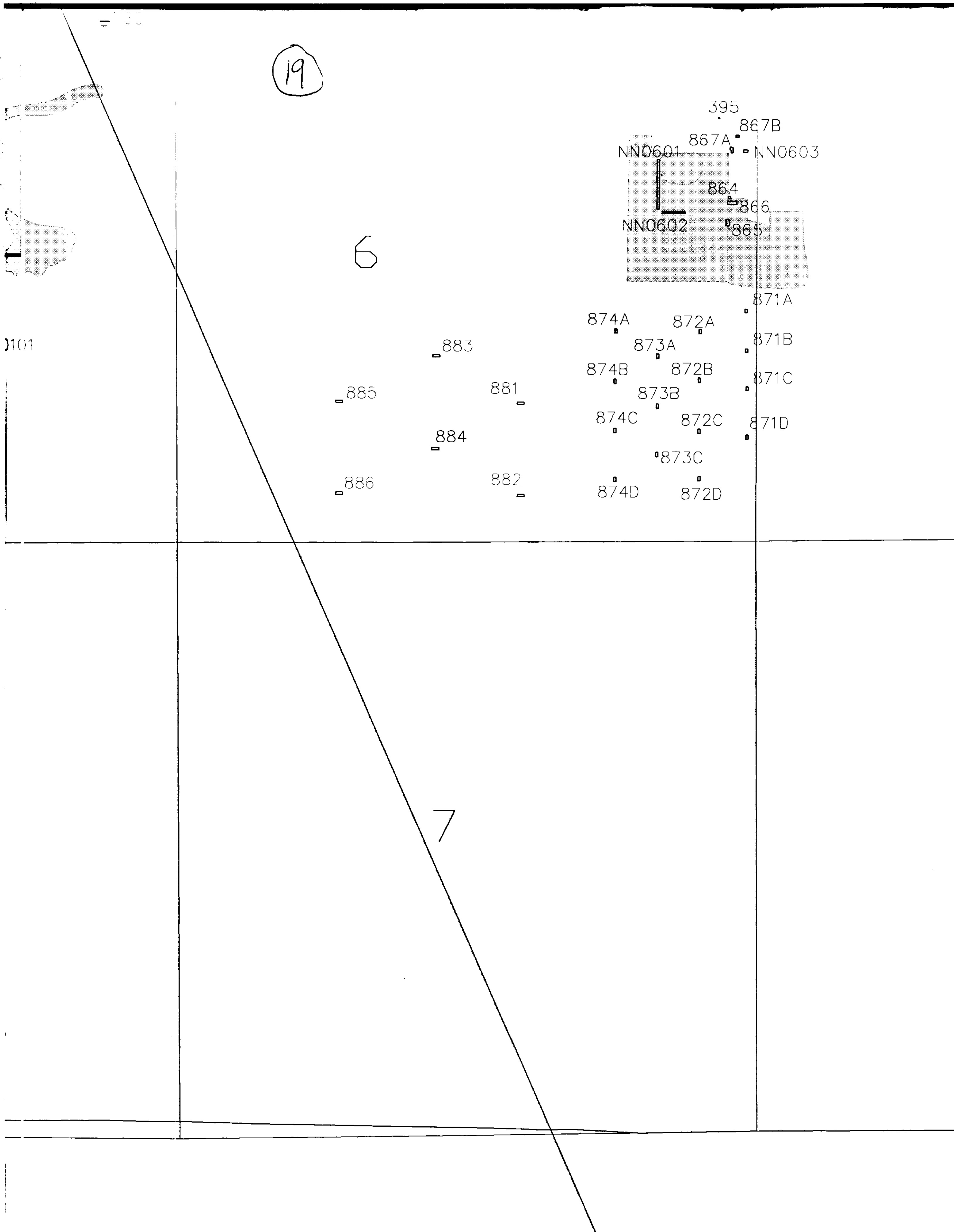
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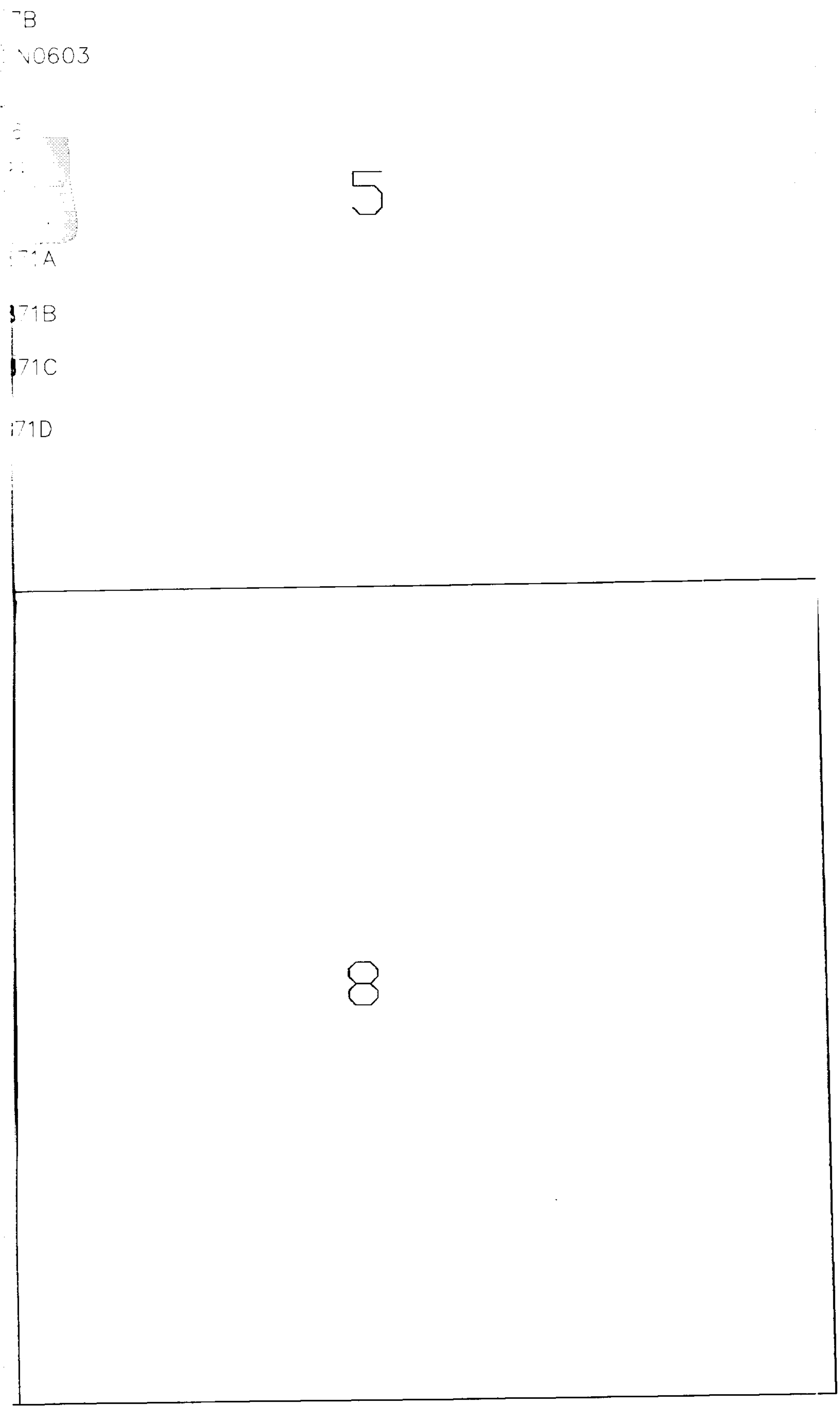

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Buildings with Future Use
No Potential Exposure Problems

Buildings with No Future Use,
Nonmanufacturing History

Buildings with No Future Use,
Manufacturing History
Process History Subgroup

Buildings with No Future Use,
Manufacturing History
Nonprocess History Subgroup

Buildings with No Future Use,
Agent History

e runs are not shown on map
stations are not shown on map
all tanks are shown on map

Shaded areas indicate sites
where contaminated soil
may require structure
removal. Does not represent all
areas of soil contamination.

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SOUTH PLANTS

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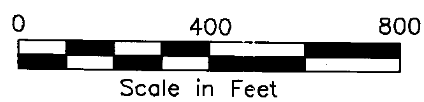

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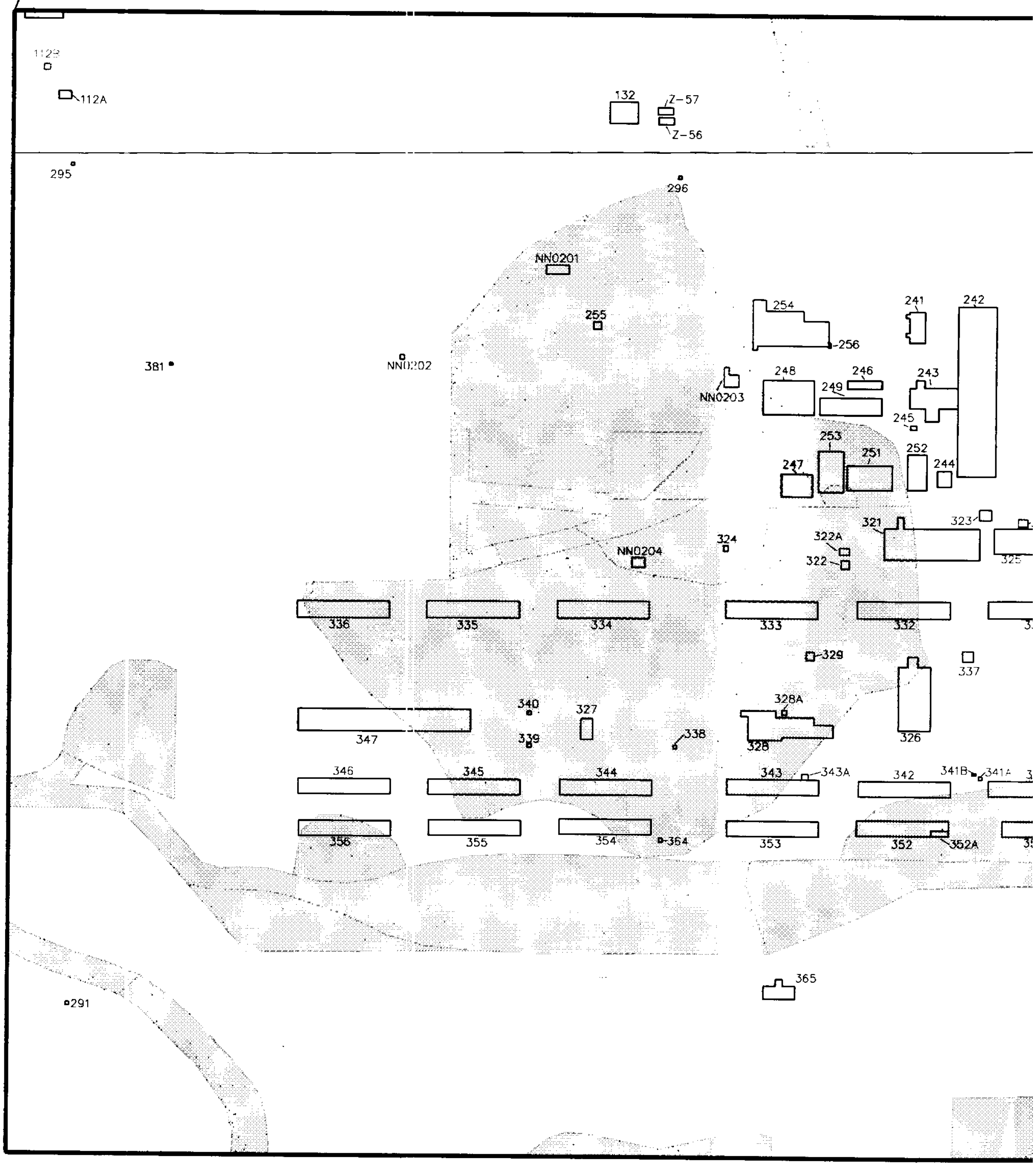

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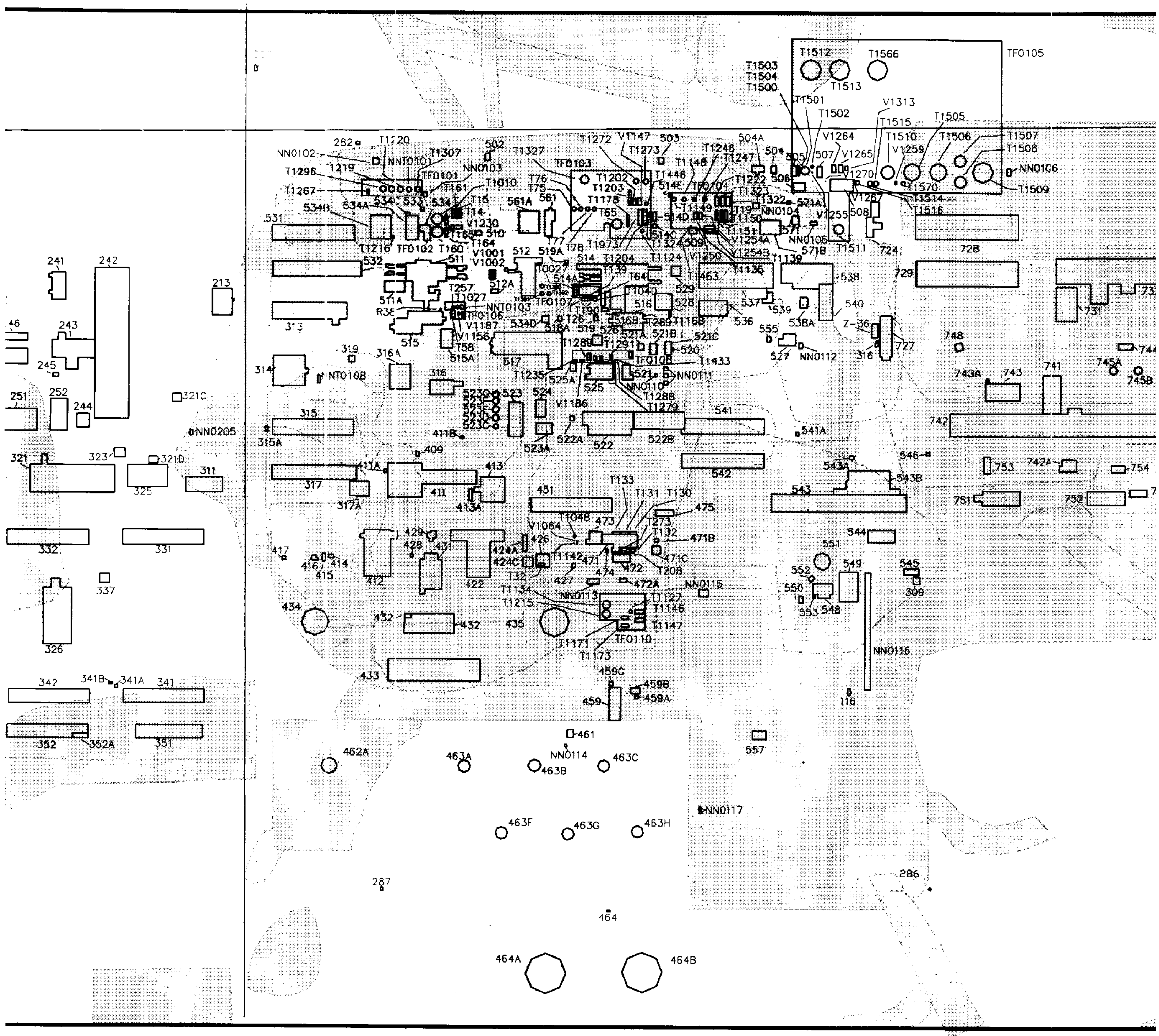

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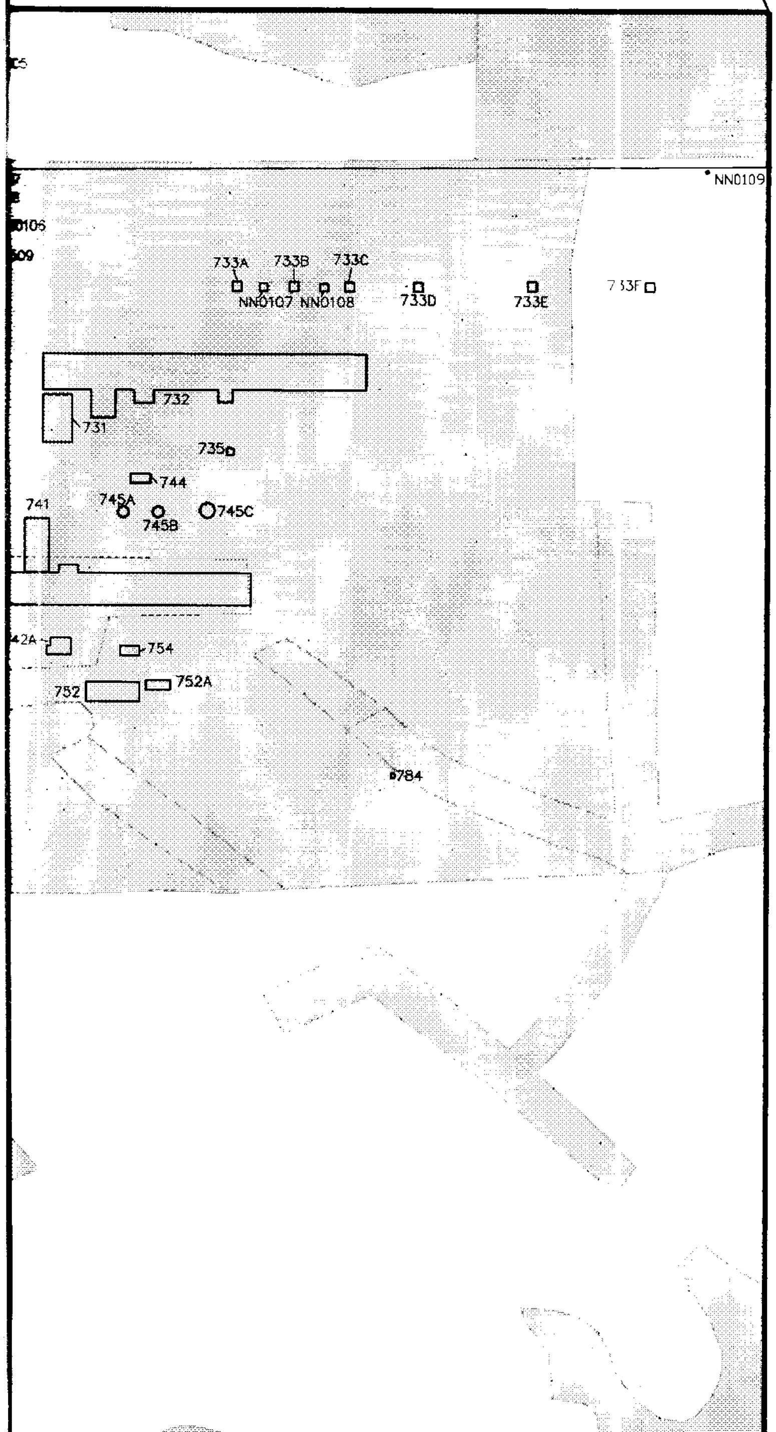
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SCALE OF BASE MAP

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Prepared for:

U.S. Army Program Manager
for Rocky Mountain Arsenal

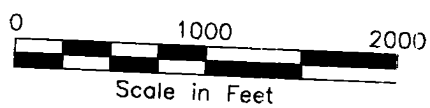
Prepared July 1993

PLATE 1.1-1 Struc

Rocky Mountain Arsenal
Prepared by: Ebasco Services

28

SCALE OF BASE MAP:



Prepared for:

U.S. Army Program Manager
for Rocky Mountain Arsenal

Prepared July 1993

PLATE 1.1-1 Structure Medium Groups

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

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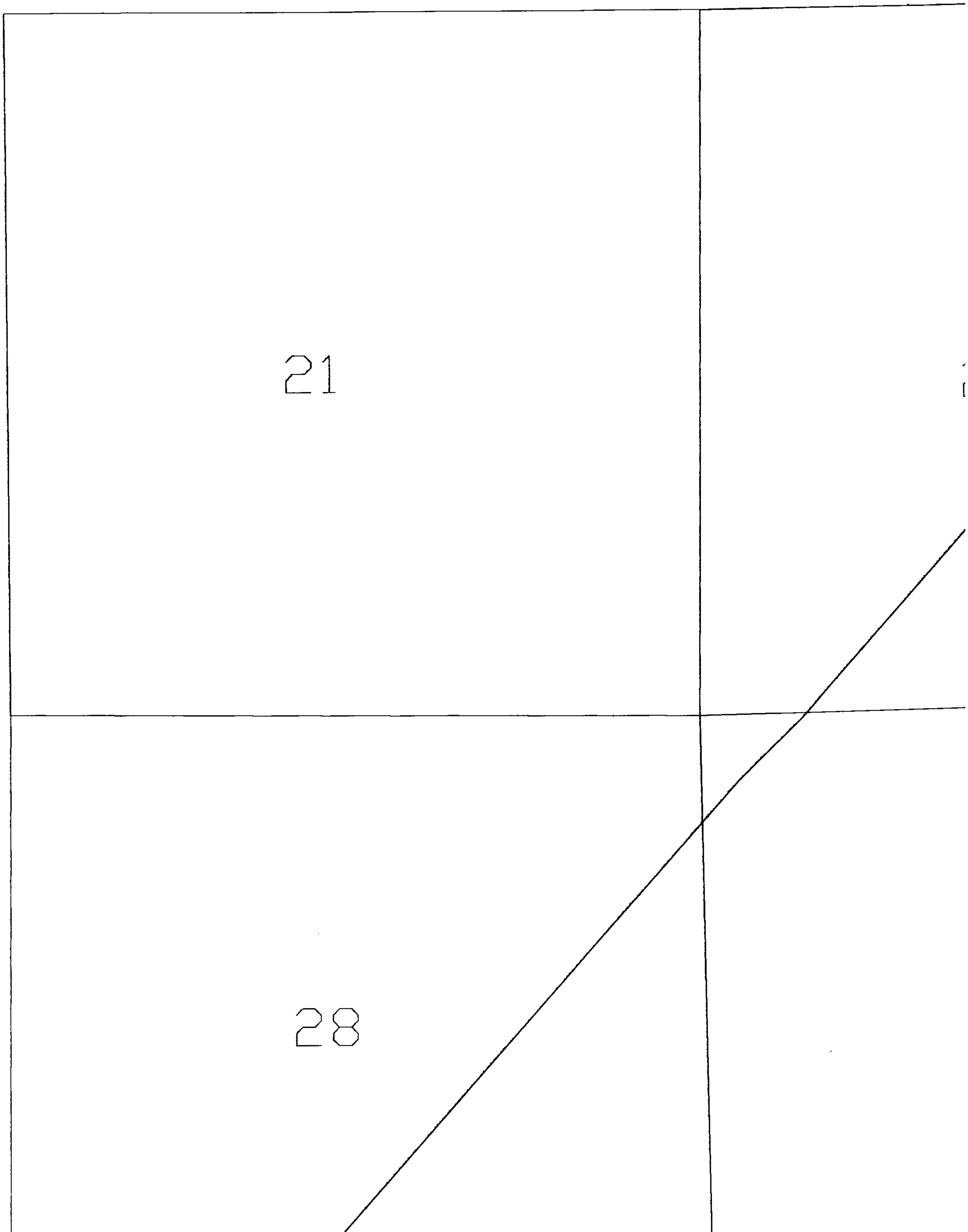

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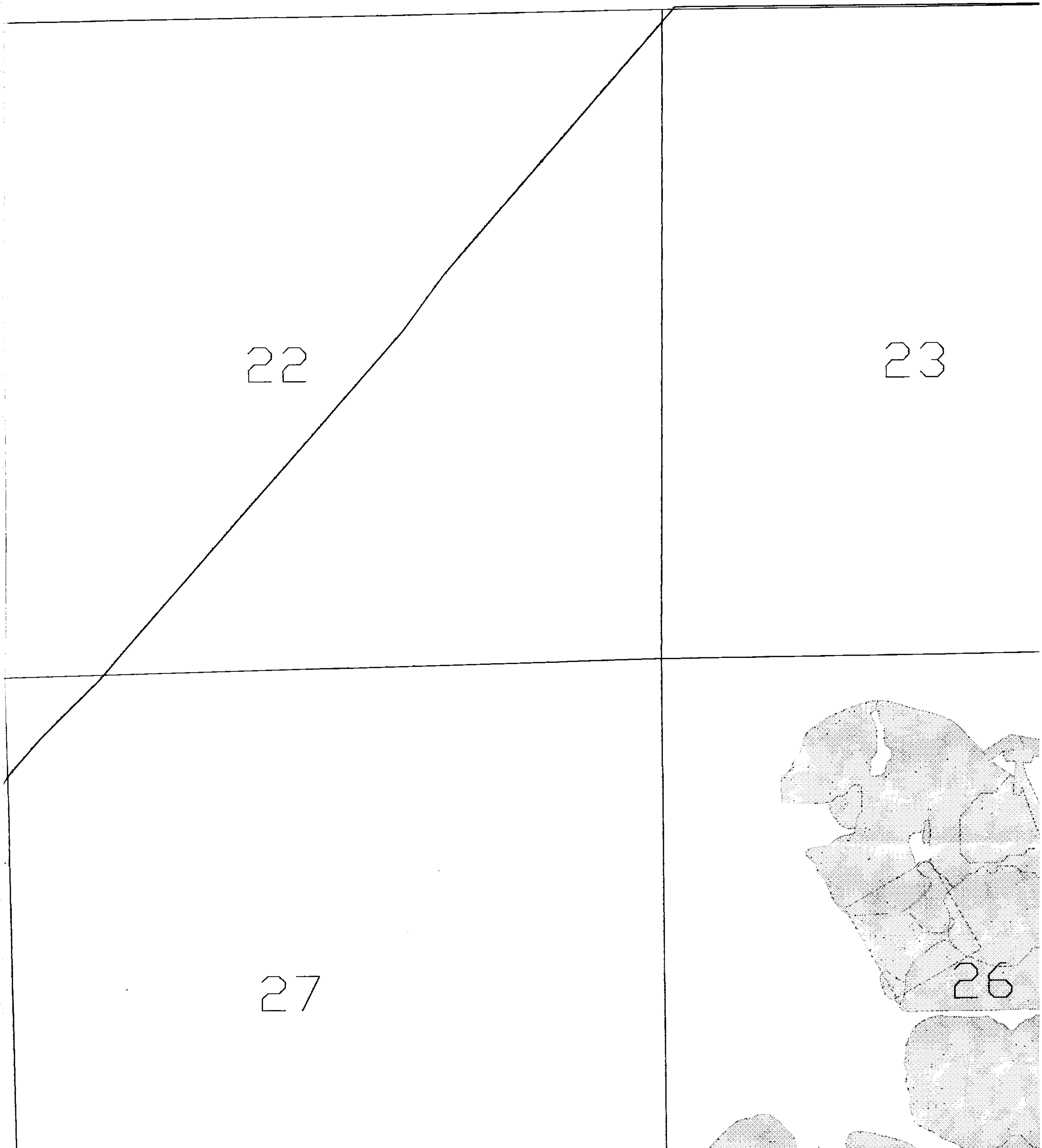

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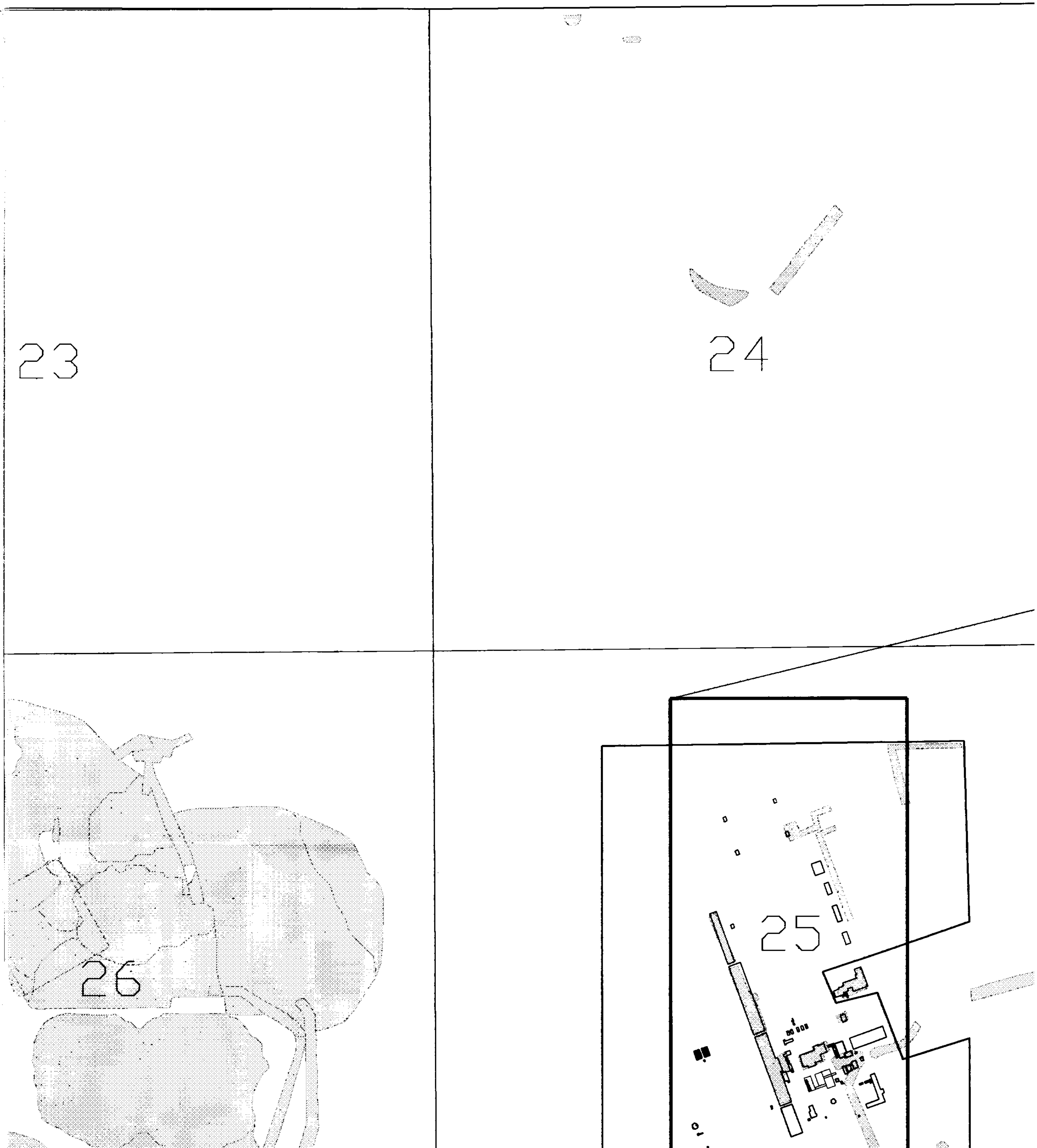

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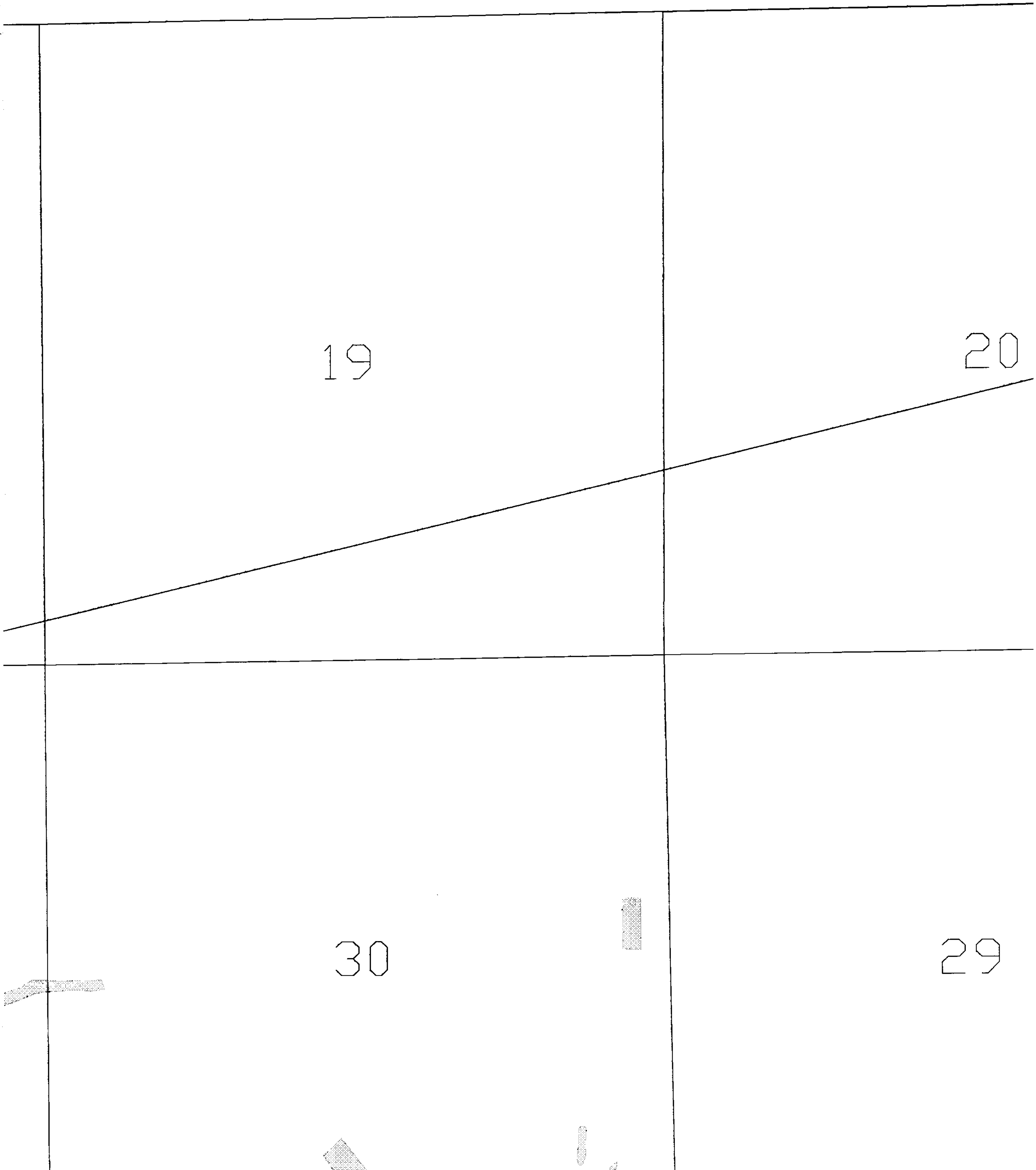

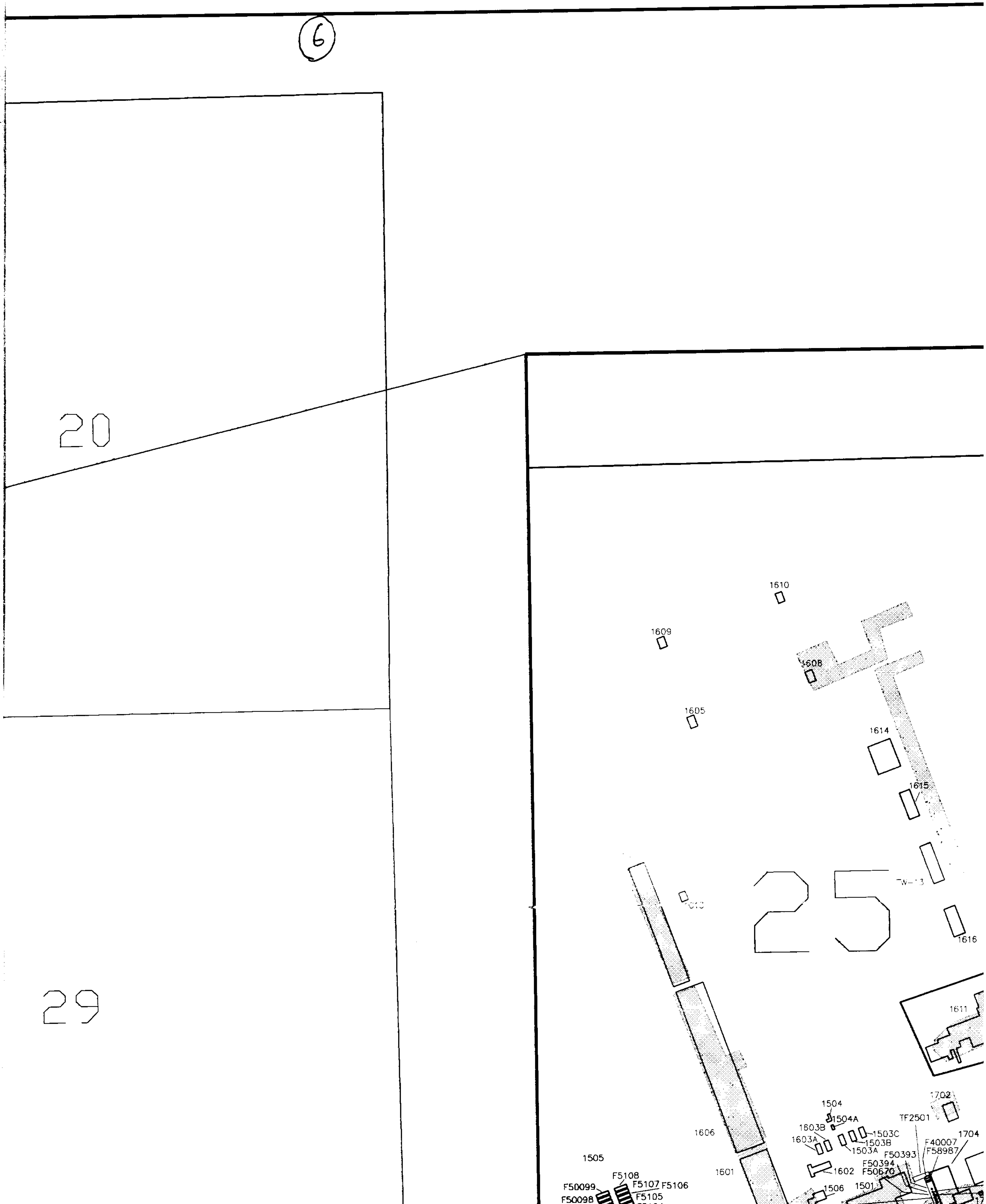

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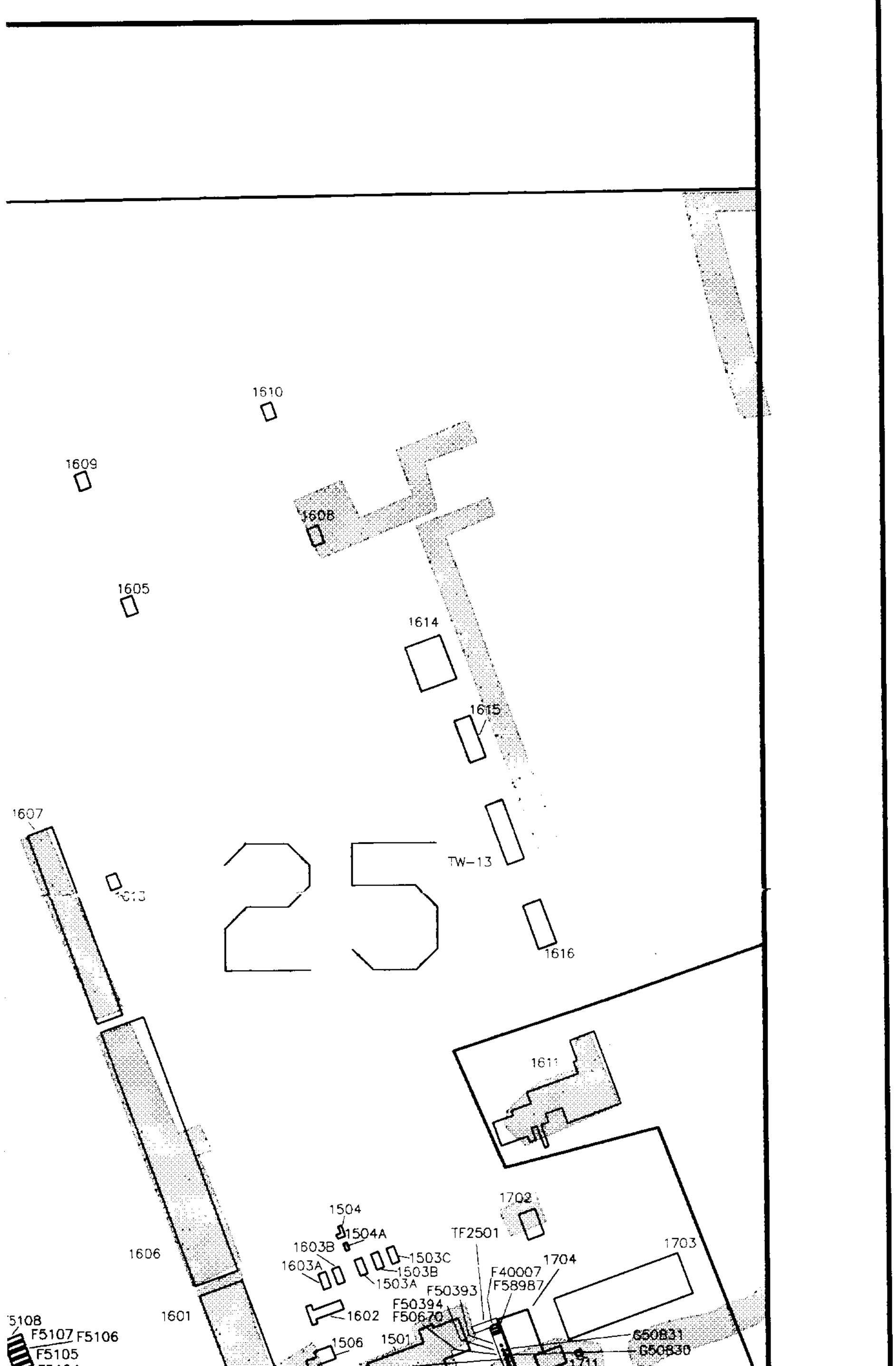

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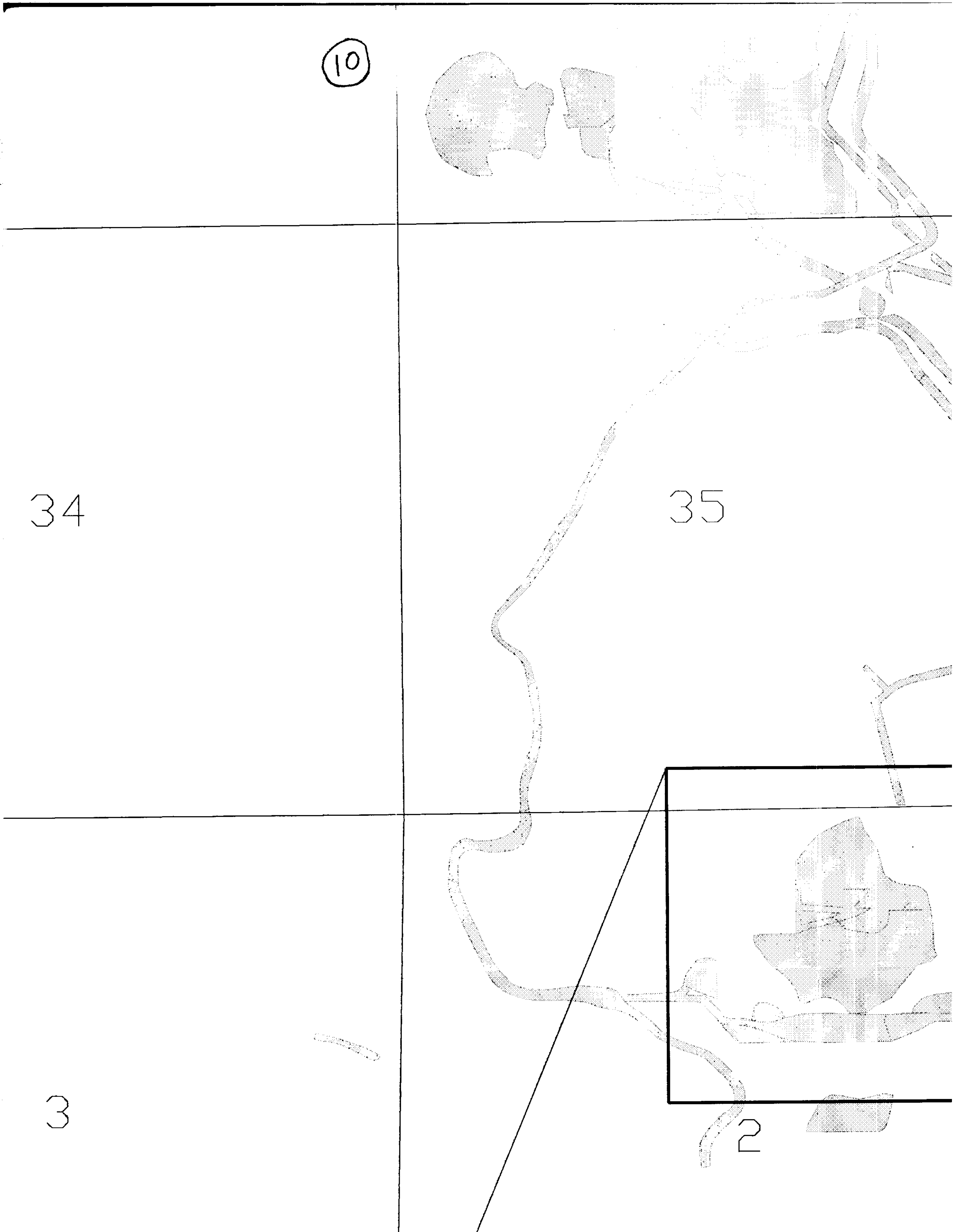
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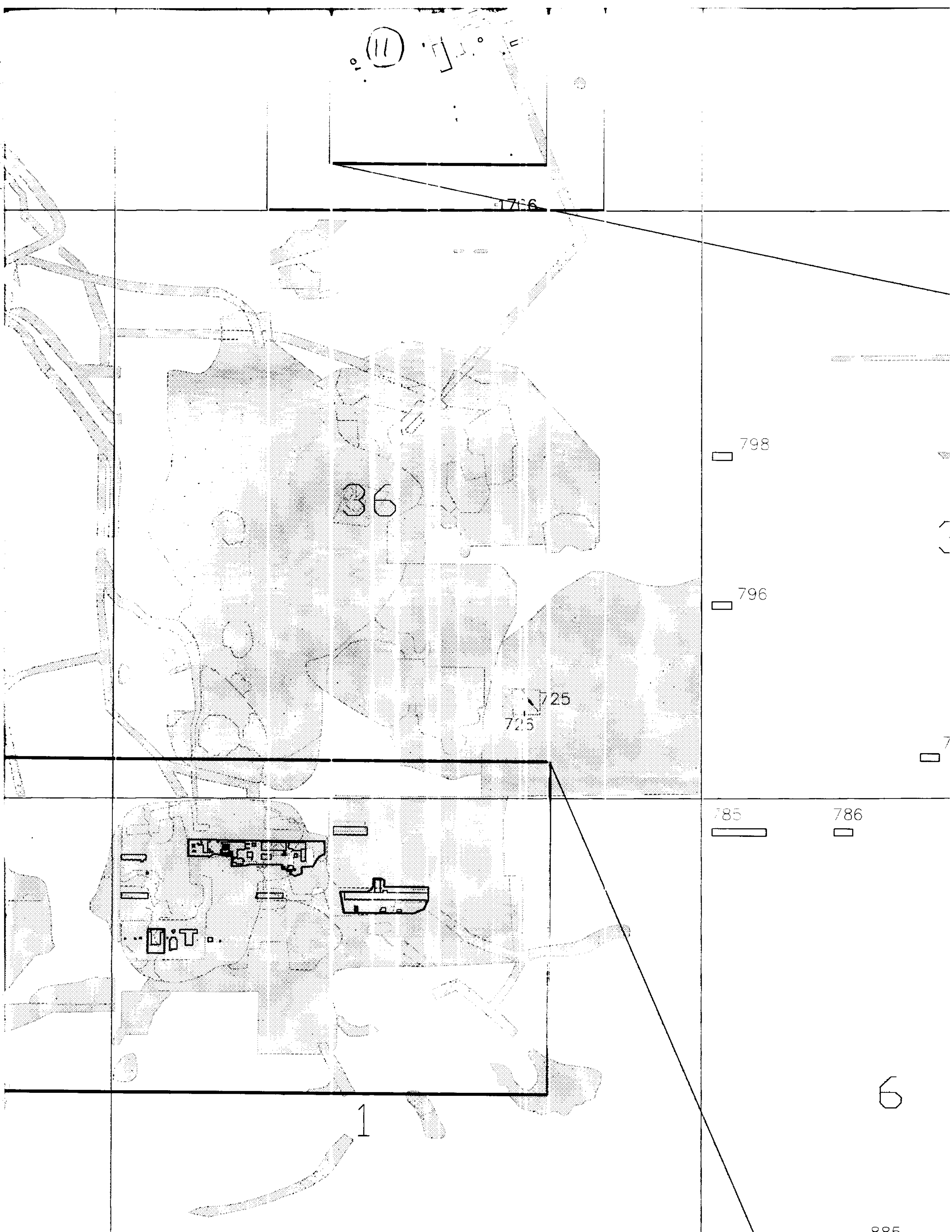

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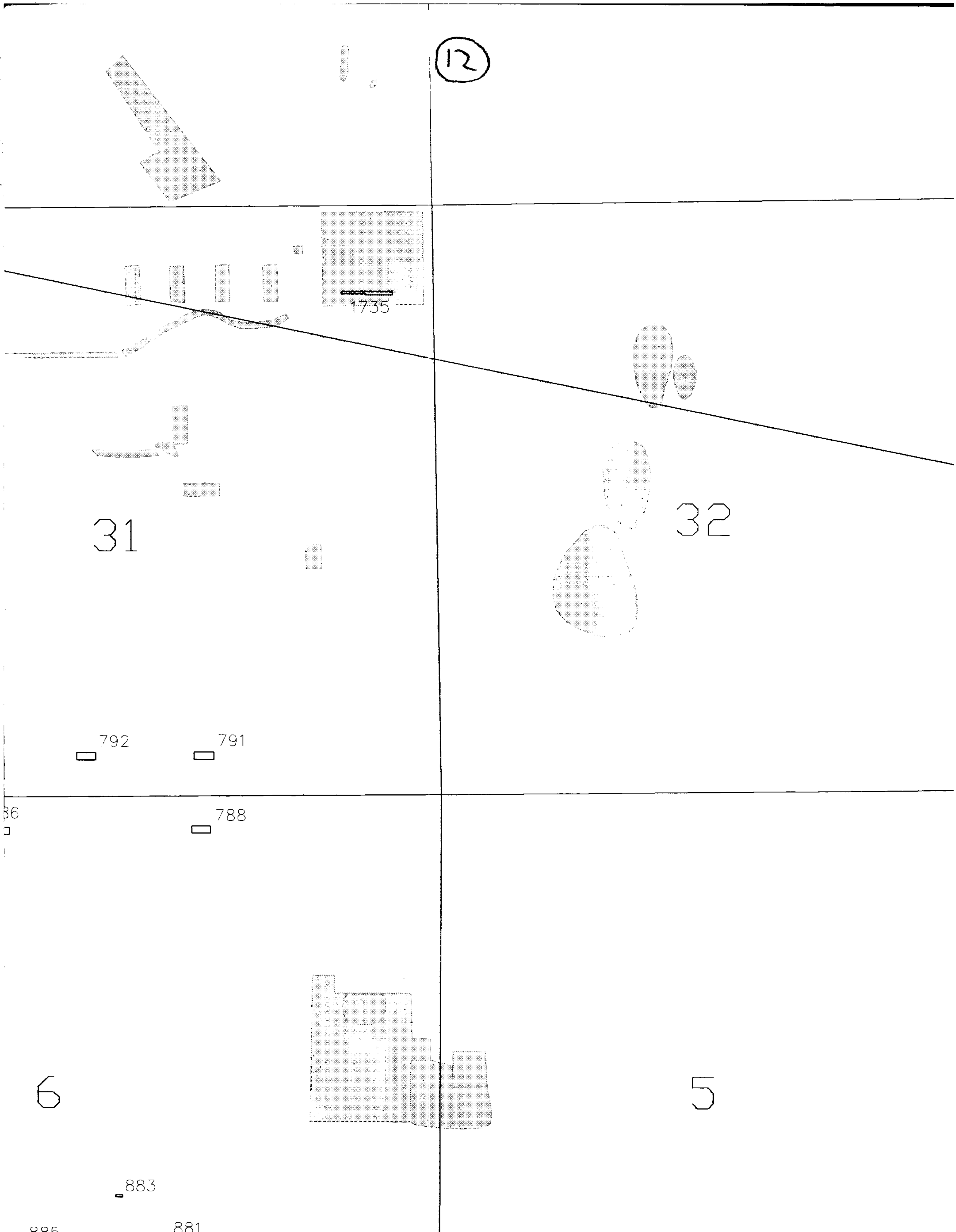

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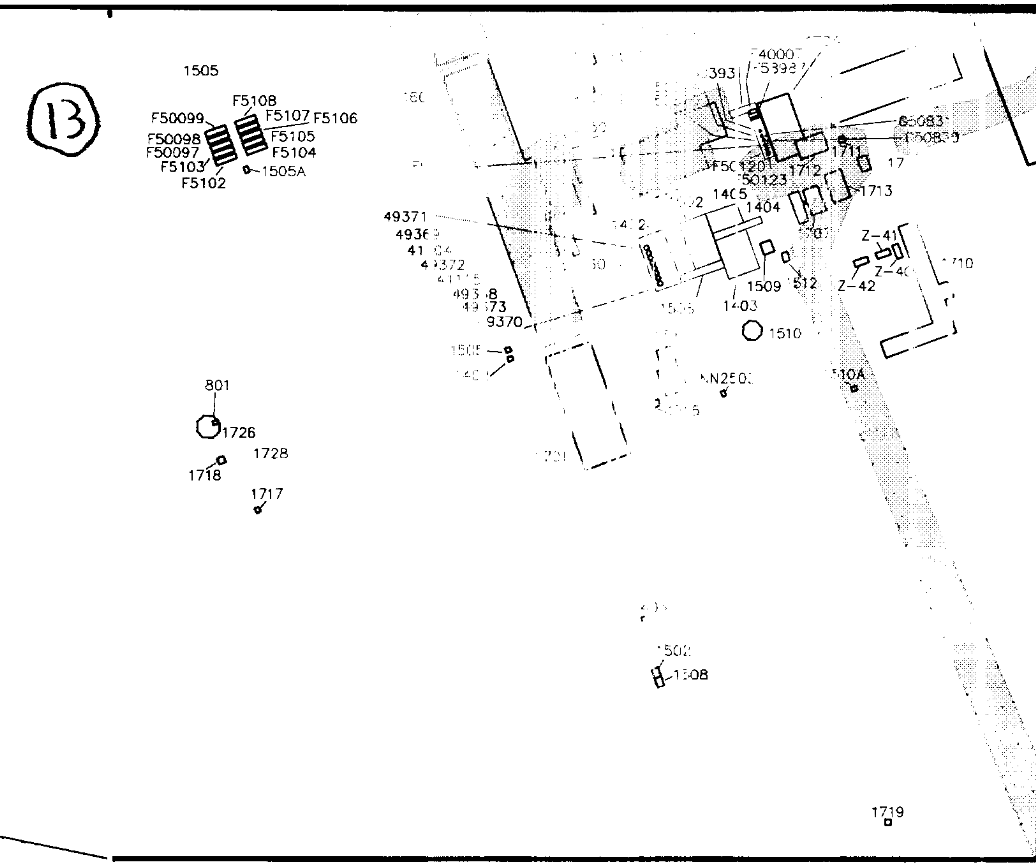

NORTH PLANTS

SCALE OF INSERTS:

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Scale in Feet

EXPLANATION

Declared Perimeter for Chemical Agent Treaties

Buildings with No Future Use, Manufacturing History Process History Subgroup

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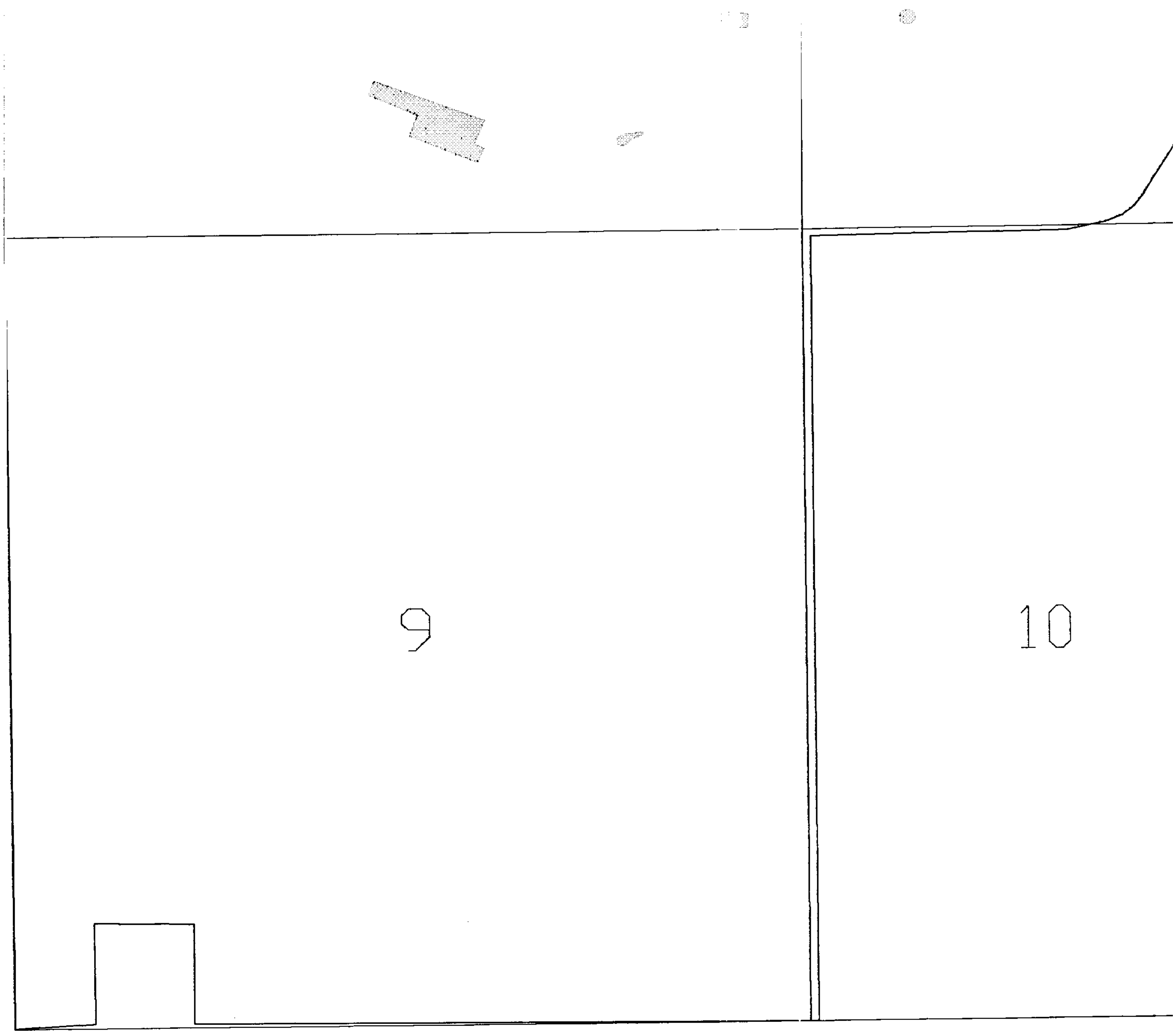

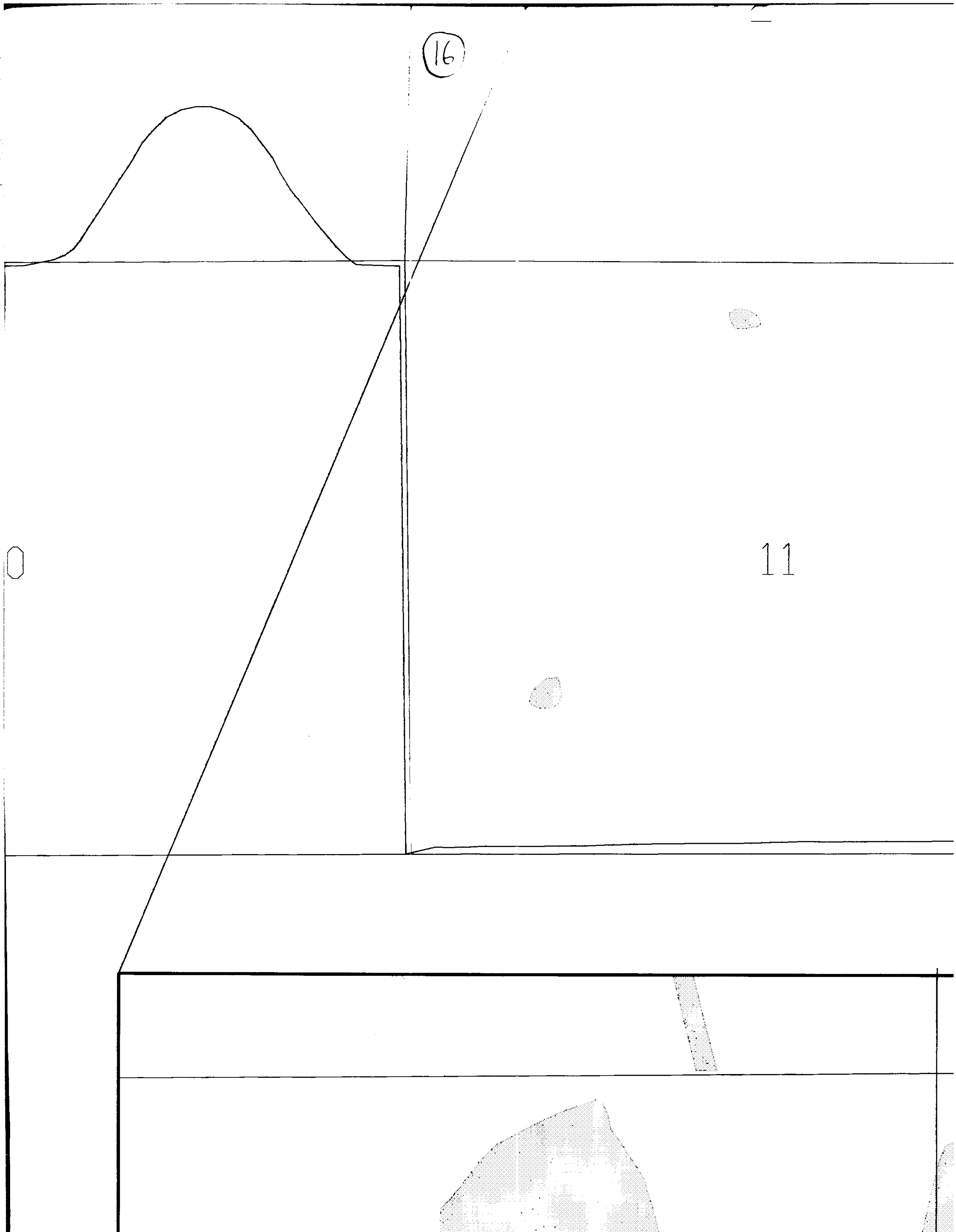
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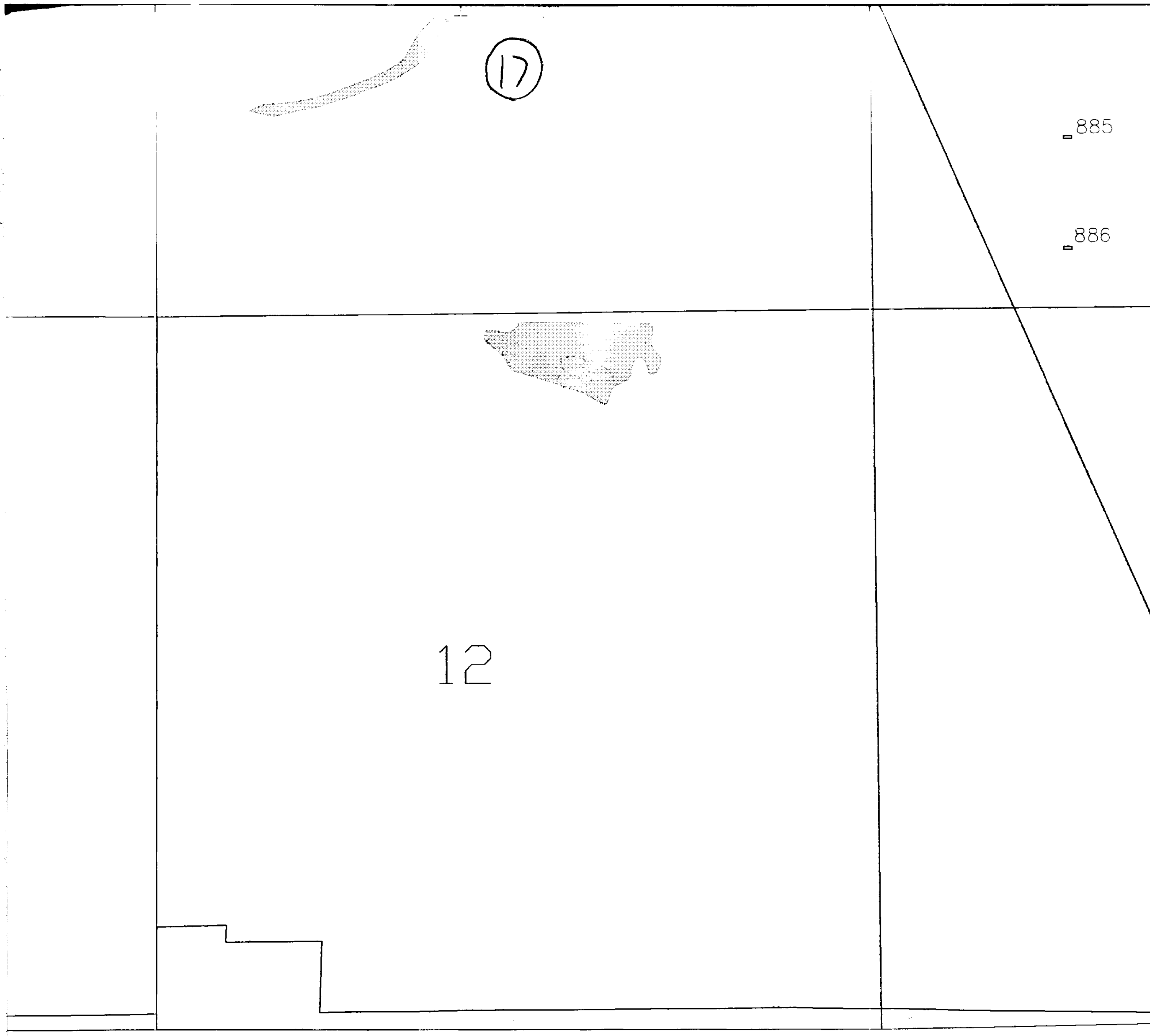
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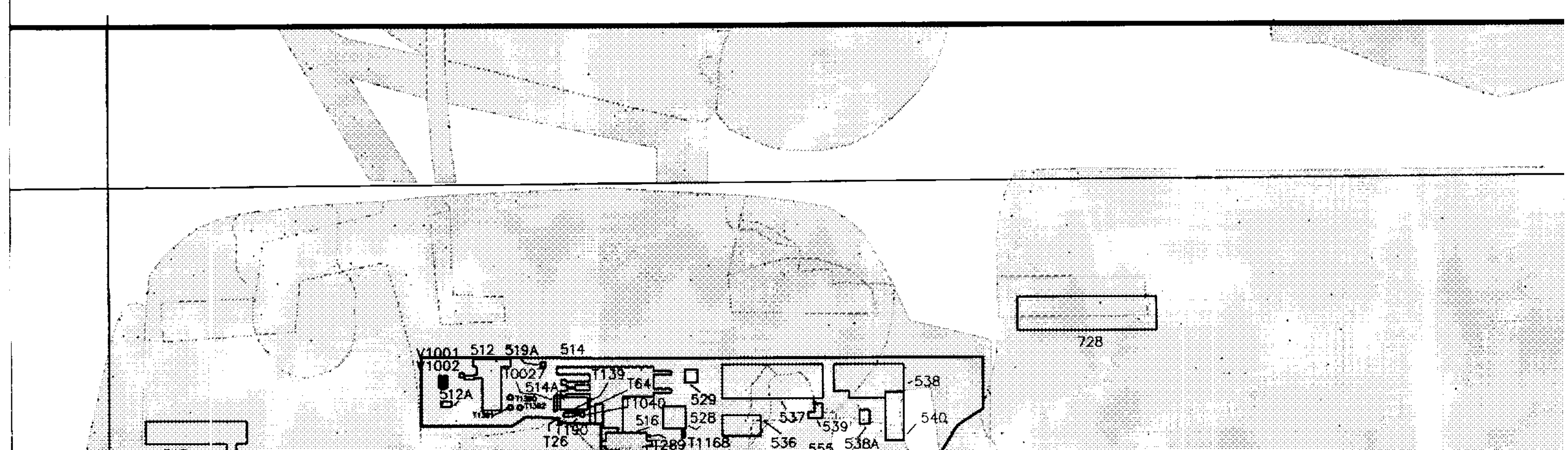
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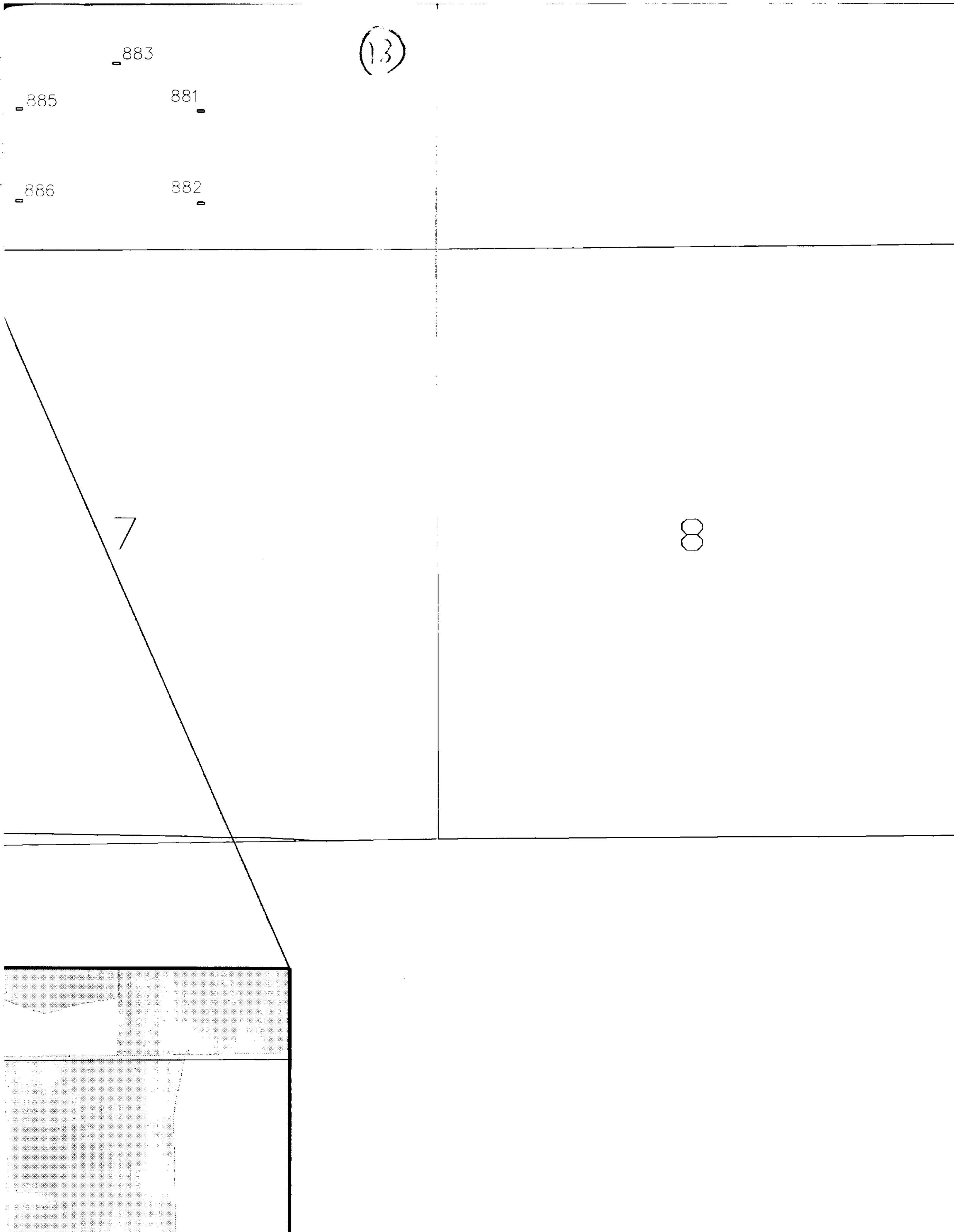
(13)
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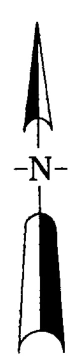
(19) Buildings with No Future Use,
Manufacturing History
Process History Subgroup

Buildings with No Future Use,
Manufacturing History
Nonprocess History Subgroup

Buildings with No Future Use,
Agent History

Pipe runs are not shown on map
Substations are not shown on map
Not all tanks are shown on map

Shaded areas indicate sites where contaminated soil may require structure removal. Does not represent all areas of soil contamination.



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SOUTH PLANTS

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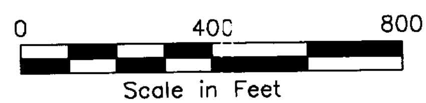

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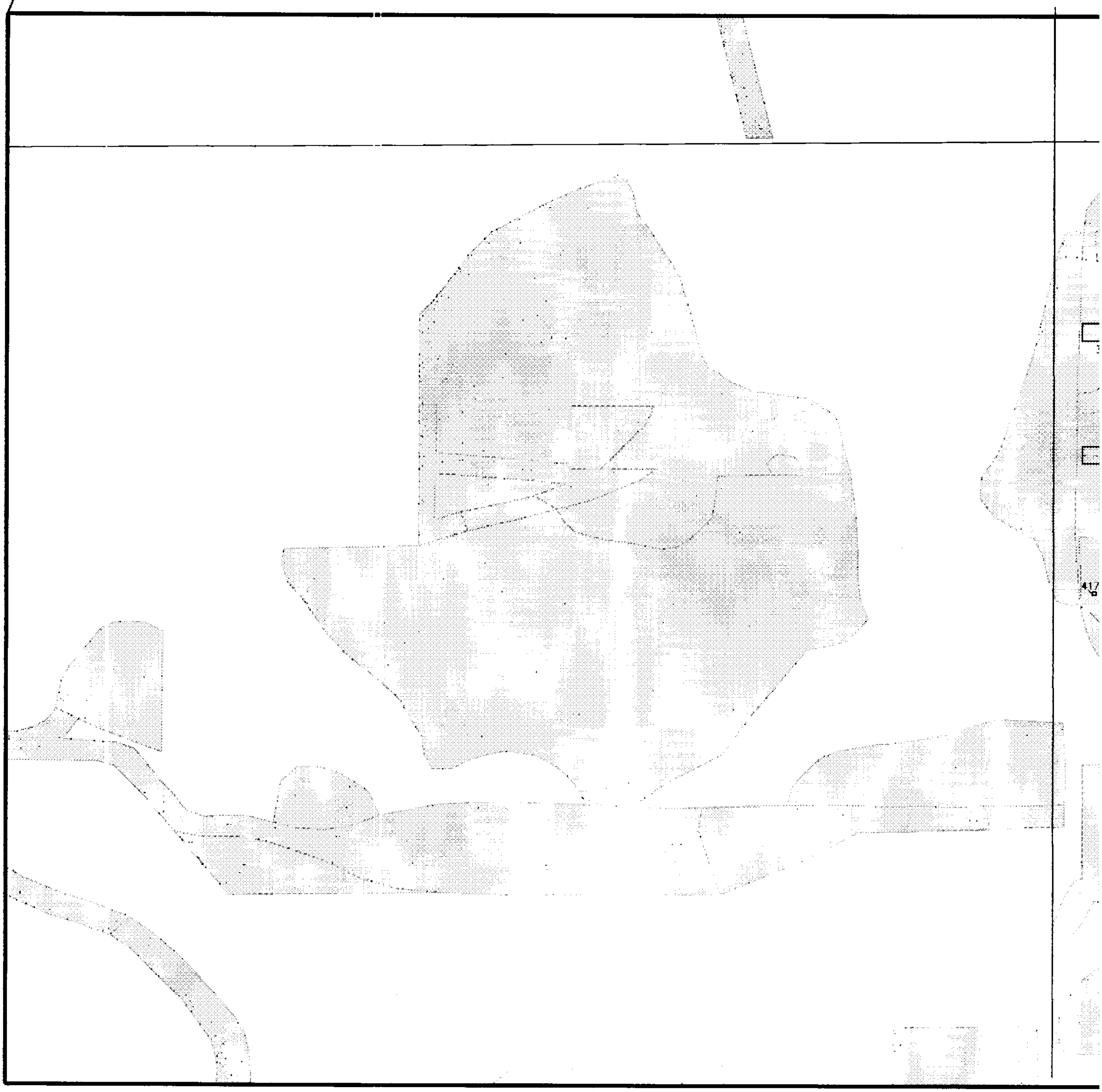

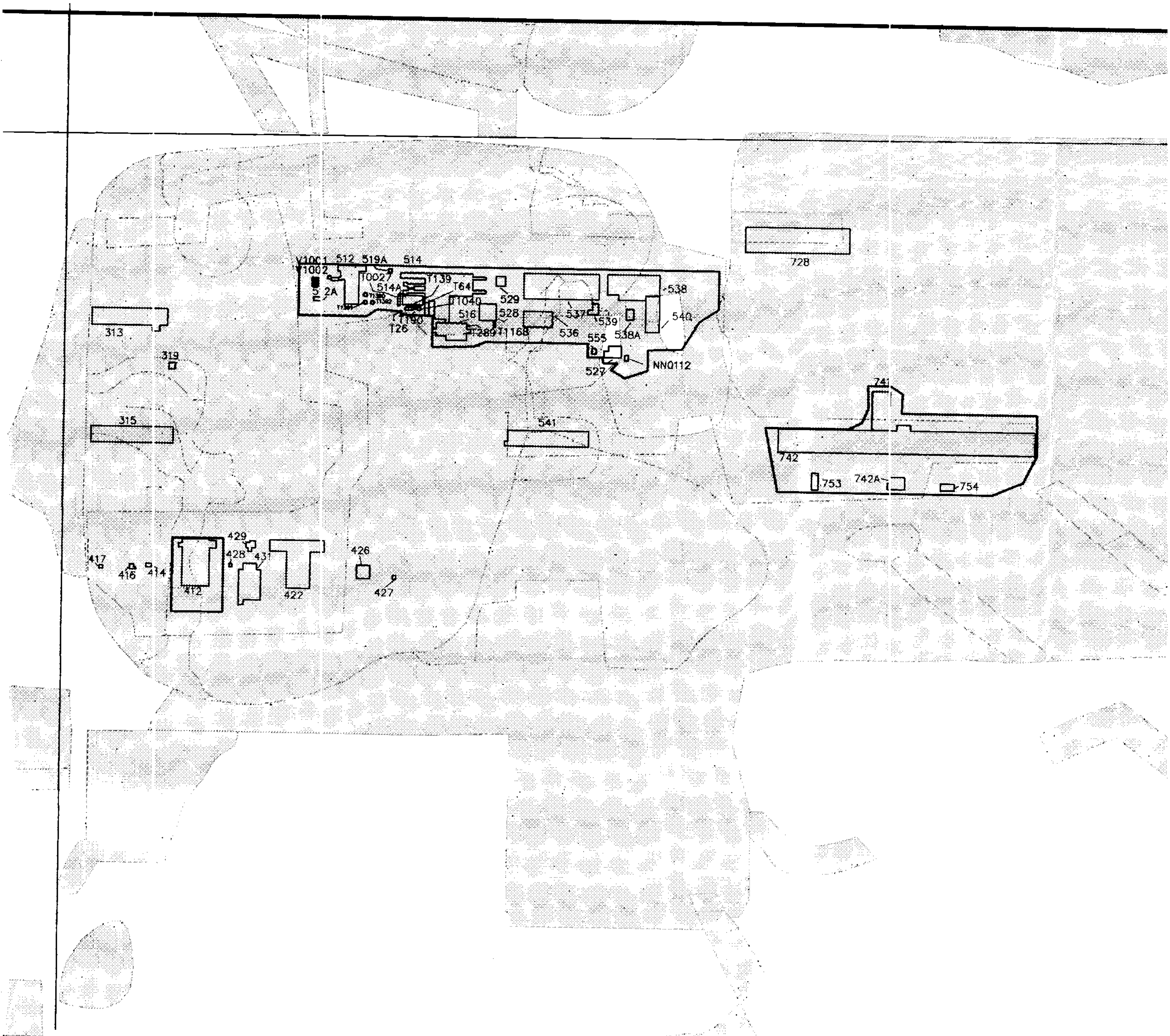

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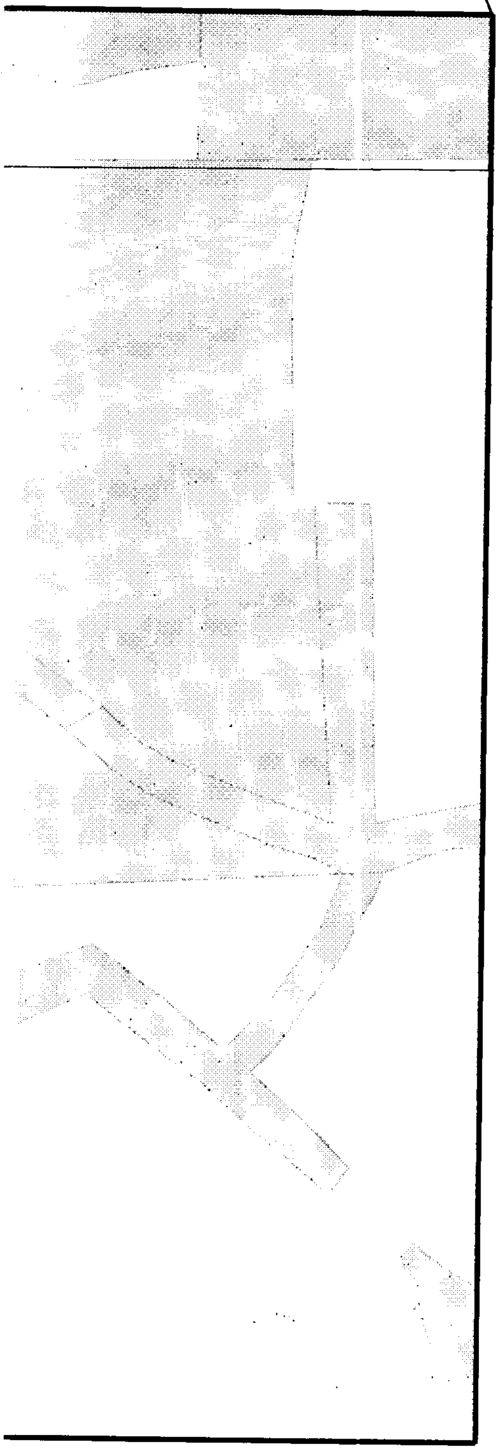

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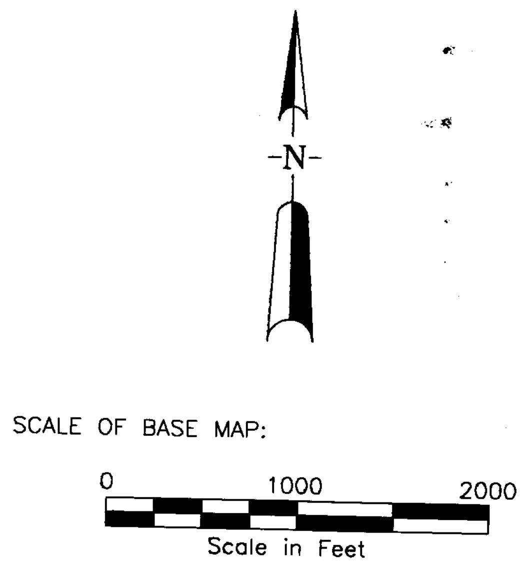

Prepared for:

U.S. Army Program Manager
for Rocky Mountain Arsenal

Prepared July 1993

PLATE 3.0-1 Agent History and Treaty Structures

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated